Part B Permit Application

SPSA Regional Landfill
Cell VII Expansion

Southeastern Public Service Authority
Suffolk, Virginia

Prepared by:

HDR Engineering, Inc.
3733 National Drive, Suite 207
Raleigh, North Carolina 27612

Permit No. 417
August 2008
Revised February 2011

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Suffolk, Virginia

Prepared for:

Southeastern Public Service Authority
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* Cells I through VI have been constructed prior to this amendment to incorporate the Cell VII Expansion. These documents and associated QA/QC construction reports are maintained in the facility operating record and incorporated here by reference only.

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MODULE I
General Permit Conditions

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PERMIT MODULE I
GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any circumstances are held invalid, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations (9 VAC 20-80 et seq. § 1.0), unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. The Director means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and 9 VAC 20-80. The effect of this permit is detailed in 9 VAC 20-80-550, and it shall be the duty of the permittee to insure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in 9 VAC 20-80-570. The facility will be designed and constructed per the requirements of Module III and associated Permit Attachments, operated and maintained per Module II, closed and maintained in post-closure per Modules XII and XIII, and subject to a groundwater monitoring program per Permit Modules X and XI and Permit attachment X-1. In addition to these requirements, the following additional conditions are invoked per 9 VAC 20-80-490, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance 9 VAC 20-80-550 C and G. Any other permit noncompliance constitutes a violation of the Virginia Waste Management Act and is grounds for enforcement action or for permit revocation, revocation and reissuance, or modification (9 VAC 20-80-600 and 620).

I.B.2. The permittee shall comply with the requirements of this permit and any provision of RCRA Subtitle D (Title 40, Code of Federal Regulations, Section 258) requirements as they become applicable upon their effective date. This permit may not act as a shield against compliance with any part of RCRA, Subtitle D, or any other applicable federal regulation, state regulation or state law.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.B.4. In the event of noncompliance with this permit, the permitee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent significant adverse impacts on human health or the environment.

I.B.5. The permittee shall at all times properly operate and maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the operations manual and the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing, and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.

I.B.6. The permittee shall furnish the Director, within a reasonable time, any relevant information which the Director may request to determine compliance with this permit, regulation, or the Act. The permittee may also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.

I.B.7. The permittee shall allow the Director, or an authorized representative, upon the presentation of appropriate credentials, to:

I.B.7.a. Enter at reasonable times upon the permitted facility where a regulation unit or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.B.7.b. Have access to and copy, at reasonable times, any records that must be kept under conditions of this permit;

I.B.7.c. Inspect any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

I.B.7.d. Sample or monitor, for the purposes of assuring permit compliance or as otherwise authorized by the Virginia Waste Management Act, any substances or parameters at any location within control of this permit.

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to 9 VAC 20-80-550 F. Before transferring ownership or operation of the facility during its operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts V and VII, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations (9 VAC 20-70 et seq.), and this permit.

I.B.10 In accordance with § 10.1-1408.2, all facilities must have a Certified Operator as required by the Board of Waste Management Facility Operators-Licensing Regulations, 18 VAC 155-20-10 et. seq.

I.B.11 Specifications for all drainage media should specify that the material shall contain no greater than 15% calcium carbonate equivalent. Department literature regarding research on leachate collection media indicates that weight loss greater than 15% results in an unacceptable loss of performance. If a greater percentage is specified or allowed, a demonstration that performance is not adversely affected must be provided to the Department for review and approval.

I.B.12 Recirculation of collected leachate shall not be allowed, in accordance with 9 VAC 20-80-290.D.3 (5.5.D.3 of VR 672-20-10), except when the area to be irrigated is underlain by a composite liner system. Furthermore, in accordance with 9 VAC 20-80-280.E.2.c (5.4.E.2.c of VR 672-20-10), decomposition gas condensate may be recirculated into the landfill provided the facility complies with the composite liner requirement and the leachate control system requirements of Part V of VSWMR. A composite liner system is a system designed to meet the requirements of 9 VAC 20-80-250.B.9.

I.B.13. The closure cost estimate must reflect the maximum cost of closure at all times. The owner has the responsibility to maintain the closure and post closure cost estimate and associated financial assurance funding as conditions change.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain the following documents at the facility, or readily accessible to the Department representatives, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents:

I.C.1 Design Plans;

I.C.2. Operations Manual;

I.C.3. Gas Management Plan

I.C.4. Closure and Post-Closure Plan;

I.C.5 Groundwater Monitoring Plan;

I.C.6. Detailed, written estimate, in current dollars, of the cost of closing the facility, post-closure care and corrective action measures;

I.C.7. All other documents/records required:

I.C.7.a. Monitoring records from leachate, gas, and groundwater monitoring.

I.C.7.b. Inspection records as required from construction/installation, operational, closure, and post-closure inspection requirements.

I.C.7.c. Personnel training records.

I.C.7d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a logbook which is a daily narrative account of the activities at the landfill)

I.C.7.e. Construction quality assurance reports, record drawings and engineers certifications for all new liner and/or final cover construction;

I.C.8. An approved copy of the complete Part A permit; and

I.C.9. Documentation of the authorization to discharge leachate into the publicly/privately owned treatment works, leachate volumes sent to the POTW, and periodic leachate sampling analytical results.

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or 9 VAC 20-80, the permittee shall also submit the following documents to the Director according to the indicated schedules:

I.D.1. Prior to expansion into each new phase, the permittee shall submit all required certification documents per 9 VAC 20-80-550 A, and:

I.D.1.a. Authorization from Hampton Roads Sanitation District to discharge the increased volume of leachate and wastewater to the sewerage system and treatment works.

I.D.1.b. Report and supporting documents resulting from quality control/quality assurance activities performed during construction and installation of the liner/drainage systems, including the installation contractor's written acceptance of the surfaces to be lined, synthetic liner manufacturer and installer warranties, laboratory test results of the permeability of the drainage media overlying the liner, and representative copies (sufficient to demonstrate responsible control) of the accumulated inspection schedules resulting from the professional engineer's oversight of the construction.

I.D.2. In accordance with 9 VAC 20-80-550.A, certification from a design engineer, who must be a professional engineer licensed to practice in Virginia, that the construction of the facility has been completed in accordance with the permit, approved plans and specifications and is ready to begin operation. A certification will be required for each lined phase of development.

I.D.3. Certification (separate from I.D.2, above) from the Construction Quality Assurance (CQA) officer that the approved CQA plan has been successfully carried out and that the constructed unit meets all requirements of the permitted CQA plan, in accordance with 9 VAC 20-80-250.B.18. A certification will be required for each lined phase of development. The CQA officer must be a professional engineer licensed to practice in Virginia.

I.D.4. The as-built plans of all new groundwater and gas monitoring wells shall be submitted as these wells are installed. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.D.5. Not less than 180 days prior to the completion of the post-closure monitoring and maintenance period as prescribed by the Board's regulations or by the Director, the owner or operator shall submit to the Director a certificate, signed by a professional engineer licensed in Virginia, that post-closure monitoring and maintenance have been completed in accordance with the facility's Closure Plan, Permit Attachment XIII-1.

I.D.5.a. The certificate submitted under I.D.5, shall be accompanied by an evaluation prepared by a professional engineer licensed in Virginia, and signed by the owner or operator, which assesses and evaluates the landfill's potential for harm to human health and the environment in the event that post-closure monitoring and maintenance are discontinued.

I.D.5.b. If the Director determines that continued post-closure monitoring or maintenance is necessary to prevent harm to human health or the environment, he shall extend the post-closure period for such additional time as the Director deems necessary to protect human health and the environment and shall direct the owner or operator to submit a revised post-closure plan and to continue post-closure monitoring and maintenance in accordance therewith. Requirements for financial assurance shall apply throughout such extended post-closure period.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports notifications, or other submissions which are required by this permit to be sent or given to the Director, should be sent by certified mail to:

Director
Virginia Department of Environmental Quality
Office of Waste Permitting and Compliance
P.O. Box 1105
Richmond, Virginia 23218

With a Copy to:

Virginia Department of Environmental Quality
Solid Waste Permitting and Compliance
Tidewater Regional Office
5636 Southern Boulevard
Virginia Beach, Virginia 23462

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with all conditions of this section, as follows:

I.F.1. The final permit is based on permit application submittals (drawings and reports) that contain the word "proposed" and similarly tentative language. The documents that are incorporated into Permit No. 417 and the amendments thereof, have been evaluated for administrative and technical adequacy and have been approved as proposed. Therefore, any reference to a design, construction, operation monitoring or closure criteria are to be considered to be approved as proposed.

I.F.2. Groundwater must be maintained below the liner system until such time as waste loading surpasses the uplift forces of groundwater. When waste in Cells V, VI, and/or VII reaches elevation 46 feet MSL, the pumping of groundwater may be discontinued.

I.F.3. Cells V, VI, and VII, are zone of saturation landfills constructed below the water table. The artificial lowering of the ground water table for the development of the landfill is authorized through a Ground Water Withdrawal Special Exception issued by the Office of Surface and Ground Water Supply Planning (OSGWSP). Separate exceptions are issued for each cell. The duration of each authorization is 10 years. Prior to obtaining final authorization, a temporary construction dewatering phase allows construction for up to 24 months or until completion of cell construction, whichever comes first. Prior to placement of waste in Cell VII, SPSA shall have obtained the final 10 year authorization for Cell VII. Therefore, within two years of the commencement of Cell VII construction dewatering the facility must submit documentation that the Ground Water Withdrawal Special Exception has been issued. SPSA may be required to apply for an amended Groundwater Withdrawal Special Exception if it is determined that the proposed groundwater extraction rate is not adequate to effectively dewater Cell VII.

I.F.4. The Southeastern Public Service Authority will reconstruct the well screen interval in monitoring wells if the drawdown experienced during groundwater withdrawal results in a reduction of the water column in any monitoring well to less than one (1) foot. Additionally, if the groundwater level exceeds the uppermost elevation of the screened interval of a monitoring well due to aquifer recovery following decommissioning of dewatering pumps, the facility shall be responsible for reconstructing the monitoring well to meet the requirements of VSWMR 9 VAC 20-80-300.A.3.c and A.3.e.

I.F.5. Recirculation of leachate is not permitted at this facility.

I.F.6. According to the Virginia Department of Transportation (VDOT) approval letter dated December 5, 2005, there are no improvements required to the intersection of Route 13/58/460, Bob Foeller Drive, and Welch Parkway as a result of the Cell VII expansion. An amendment to the Part A application and VDOT approval and adequacy report will be required if the facility proposes to increase the daily maximum disposal rate beyond 7,500 tons per day. The Part B Permit Application for increasing the daily maximum disposal rate may not be submitted until a Part A amendment is reviewed and approved by the Department for the increased daily average and maximum tonnages.

I.F.7. Upon construction of the Cell VII liner system MW-9 and MW-22R shall be properly abandoned.

I.F.8. Prior to operation in Cell VII, a 500,000 gallon leachate storage tank shall be installed.

I.F.9. SPSA shall continue to implement strategies detailed in Permit Module II-Operations, Appendix H-Odor Control Plan. Within the time period set forth for each item below, SPSA shall also do the following:

I.F.9.a. Prior to September 30, 2011, analyze the cost and effectiveness of alternate odor neutralizer application methods, to include a permanent fixed line dispersal system, as compared to the current method of applying directly to the ground.

I.F.9.b. Within 30 days of permit issuance, update SOP 1.33 to reflect changes in personnel. Upon written request by the Department SPSA shall submit a quarterly report consisting of all Malodor Complaint Forms (EMS Form 40) filled out in response to each complaint received by the facility. The report shall also briefly summarize the number of complaints, complainants and corrective actions taken on the cover page.

I.F.9.c. Upon written request by the Department submit a quarterly log of leachate levels accumulating above the liner.

I.F.9.d. Within 30 days of permit issuance, complete the Elevated Temperature Investigation Test Plan submitted on November 5, 2010 which was implemented to investigate elevated temperatures in the landfill extraction wells in Cell V and evaluate the findings

I.F.9.e. Within 90 days of permit issuance, ensure that the existing flare tip is upgraded to enable the gas extraction system to burn additional landfill gas.

I.F.9.f. Within 60 days of permit issuance, continue preventative maintenance on the leachate vaults.

I.F.9.g. Prior to December 31, 2011, analyze the potential cost and effectiveness of an odor detection system that would use real time monitoring to develop an odor dispersion model.

I.G. MAJOR PERMIT AMENDMENTS

This section provides a historical summary of all major permit amendments.

I.G.1. At the time the facility was first permitted, development plans included the design for Cells I through IV which consists of approximately 103 acres of disposal footprint with a capacity of approximately 12.2 million cubic yards. Cell I was opened in January 1985. The liner design for Cells I-IV includes from top to bottom: a leachate collection and removal system (or LCRS) consisting of a network of perforated 6-inch ABS piping encased in trenches of granular drainage material wrapped in geotextile. Between these trenches there is a liner protective layer consisting of 2-feet of non-specified granular material. Beneath the LCRS is a 30-mil synthetic liner (or geomembrane) installed directly over a prepared subgrade.

I.G.2. For the first landfill expansion, a major permit amendment dated March 4, 1994 added 43.6 acres of lined disposal footprint designated as Cell V, which brought the total disposal footprint at the landfill to 146.6 acres. The March 4, 1994 amendment also incorporated an active methane gas recovery and power generation system for Cells I-IV. This was the first permit issued in accordance with the Virginia Solid Waste Management Regulations (VSWMR) that became effective December 21, 1988. Prior to constructing Cell V, a major permit amendment was issued November 19, 1997 to incorporate the redesign of the base liner system of Cell V placed below the local groundwater table elevation. The Cell V capacity is calculated at approximately 6.1 million cubic yards. The Cell V design is for a non-Subtitle D alternate liner that consists of from top to bottom: an 18-inch sand layer with a minimum hydraulic conductivity of $1x10^{-4}$ cm/sec, a LCRS consisting of a geocomposite drainage net with a permeability of approximately $3.3x10^{1}$ cm/sec placed with a minimum slope of 2%, a 60-mil HDPE geomembrane, a geosynthetic clay liner (or GCL), a 40-mil HDPE secondary geomembrane, a one foot thick clay liner (or geologic buffer) with a maximum hydraulic conductivity of $1x10^{-5}$ cm/sec; and, a secondary groundwater relief/dewatering layer consisting of geocomposite drainage net with a permeability of $3.3x10^{1}$ cm/sec placed with a minimum slope of 2%.

I.G.3. For the second landfill expansion, a major permit amendment dated November 7, 2005 added another 41 acres of lined disposal area designated Cell VI, bringing the total lined disposal footprint at the landfill to approximately 188 acres. The disposal capacity for waste and operations of Cell VI is approximately 8.9 million cubic yards. Similar to Cell V, the Cell VI liner design is for a non-standard Subtitle D alternate liner installed below the water table. The only difference is that the Cell VI liner design contains no minimum permeability specification for the 12-inch geologic buffer. The Cell VI liner design consists of from top to bottom: an 18-inch sand layer with a minimum hydraulic conductivity of $1x10^{-4}$ cm/sec, a LCRS consisting of a geocomposite drainage net with a permeability of approximately $3.3x10^{1}$ cm/sec placed with a minimum slope of 2%, a 60-mil HDPE geomembrane, a geosynthetic clay liner (or GCL), a 40-mil HDPE secondary geomembrane, a one foot thick soil layer (or geologic buffer) with no maximum hydraulic conductivity specified; and, a secondary groundwater relief/dewatering layer consisting of geocomposite drainage net with a permeability of $3.3x10^{1}$ cm/sec placed with a minimum slope of 2%.

I.G.4. For the third landfill expansion, a major permit amendment is proposing to add 56 acres of lined disposal area designated as Cell VII, bringing the total lined disposal footprint at the landfill to approximately 244 acres. The disposal capacity for waste and operations in Cell VII is approximately 10.8 million cubic yards with an estimated site life of approximately 5.9 years and with the remaining capacity in Cells VI and VII will extend the life of the facility to the year 2018. Similar to Cells V and VI, the Cell VII liner design is for a non-standard Subtitle D alternate liner installed below the water table. The Cell VII liner design consists of from top to bottom: an 18-inch sand layer with a minimum hydraulic conductivity of 1.2×10^{-4} cm/sec, a LCRS consisting of a geocomposite drainage net with a permeability of approximately 2.17 cm/sec placed with a minimum slope of 2%, a 60-mil HDPE geomembrane, a geosynthetic clay liner (or GCL), a 40-mil HDPE secondary geomembrane, a one foot thick soil layer (or geologic buffer) with no maximum hydraulic conductivity specified; and, a secondary groundwater relief/dewatering layer consisting of geocomposite drainage net with a permeability of 2.17 cm/sec placed with a minimum slope of 2%. The Groundwater Monitoring Plan (GMP) is updated to correct the statistical procedure for pooling sampling events at all cells at the landfill. In the Cell VII expansion area, one new upgradient groundwater monitoring well MW-37, and six new downgradient groundwater monitoring wells (MW-31 through MW-36) are incorporated into the facility's groundwater monitoring network.

I.H. MINOR PERMIT AMENDMENTS

This section provides a historical summary of all minor permit amendments.

I.H.1. The permit was amended May 1, 2000 in accordance with a minor amendment request and associated supporting information submitted February 15, 2000. The permit amendment addressed clarifications and corrections to the construction specifications, CQA plan, and facility phasing. The modified documents included:

I.H.1.a. The operational filling plan in the original permit (drawings C-05 and C-06) has been revised to indicate Phase I-B as the first area to receive waste. The revised sequence of filling moves from 1-B to 1-A to 2-A to 2-B. The revised drawings denoted as C-05 issue A1, and C-06 issue A3 have been inserted into Permit Attachment III-2 to replace the existing drawings C-05 and C-06.

I.H.1.b. Geomembrane Sample Size - Section 02775, § 3.01.B.6.a. of Permit Attachment III-1 was modified to provide that sample sizes would be of adequate size to perform the testing in accordance with ASTM standards. A copy of the revised specification was inserted into Permit Attachment III-1, Section 02775.

I.H.1.c. Hydraulic Conductivity Testing - Section 02776, § 2.01.C. was modified to state that the backpressure should be chosen based on the ASTM D5084 guidelines. A copy of the revised specification has been inserted into Permit Attachment III-1, Section 02776.

I.H.1.d. Revised financial assurance documentation was inserted into Permit Attachment XIII-1, "Closure," to update the existing cost estimates in place at the time.

I.H.1.e. Revised pages for the closure/post-closure plan were inserted into Permit Attachments XII-1 and XIII-1.

I.H.2. The permit was amended November 14, 2000 based on information submitted August 15, 2000. The modified documents included:

I.H.2.a. Technical Specification 02220 - Section 3.05, Paragraph F.2 of Permit Attachment III-1 indicates a specific moisture content range for structural fill. Attached is a copy of the revised text, which allows the moisture content to be defined through testing.

I.H.2.b. Technical Specification 02240 - Section 3.01, Paragraph C of Permit Attachment III-1 indicates that a minimum density of 85 percent as determined by the Standard Proctor should be maintained for the drainage layer. Attached is a copy of the revised text deleting this statement from the specification.

I.H.2.c. Technical Specification 02276 - Section 3.03, Paragraph H of Permit Attachment III-1 indicates that for best results the soil moisture content should be between 2 percent and 5 percent wet of optimum moisture content. Attached is a copy of the revised text which states that the optimum moisture content should be determined through testing of the soil source.

I.H.2.d. Technical Specification 02800 - Table 1 of Permit Attachment III-1 indicates the required Geosynthetic Clay Liner (GCL) properties. This table was revised to change the Bentonite Content test method and value to conform with current industry standards as was Table 2 for un-reinforced GCLs.

I.H.3. The permit was amended May 23, 2000, by authorizing the acceptance of treated, but un-shredded regulated medical waste from permitted regulated medical waste treatment facilities that have received a variance from the Department to the shredding requirement in the Regulated Medical Waste Management Regulations (9 VAC 20-120-10, *et seq.*). This action required an update to the Operations Manual (Section 5.2.9, Special Wastes).

I.H.4. The permit was amended November 21, 2000 to allow for the use of alternative materials as protective cover material for Cell V. Specification Section 02240, Drainage Layer for SPSA Cell V Expansion, revision date 10-02-00, Part 2.01 incorporates the technical specification for the materials that may be used.

I.H.5. The permit was amended February 21, 2003 to revise the final cover design in the closure plan for Cells I through IV. The design was revised to incorporate a geocomposite drainage layer.

I.H.6. The permit was amended March 5, 2005 to allow for a subset of monitoring wells (MW10, MW-15, MW-16, MW-4R, MW-22R, MW-24, MW-25, MW-26, MW-27, MW-28, MW-29, and MW-30). These wells have not exhibited a statistically significant increase (SSI) over background concentrations of leachate contaminants and are allowed to forgo annual monitoring for the full Table 5.1 list of constituents. If any of these wells exhibits a SSI, it will be excluded from the subset.

I.H.7. The permit was amended in July 31, 2007 to incorporate minor modifications into to the facility's permit. This action approves 5 requests for minor amendments that have been submitted since September 2006, and is classified as a minor amendment requiring director approval. The permit is amended as follows:

1.H.7.a. Whereas the closure plans originally delineated two phases of closure, a more detailed closure construction sequence was requested in response to leachate outbreaks that were becoming problematic on the outside slopes of this disposal area. Accordingly, a request for a minor permit amendment was submitted on behalf of SPSA by Mr. Douglas DeCesare, P.E., of HDR Engineering, Inc. in his letter dated September 13, 2006. As agreed at the August 2006 meeting, the schedule is now designating nine closure construction phases. As a result of this amendment, the following documents are incorporated into the permit:

- Permit Attachment XII-1, Closure Plan; insert the Construction Schedule for Cells I through IV. Page 8-1 is revised to reference a 2.5 year construction schedule. Insert the construction schedule directly in front of this page.
- Permit Attachment IIIA-2, Cell 6 Design Drawings: Drawing C-08 is revised to indicate the proposed 9 phases of closure construction; Drawing C-18 is revised to reference the amendment of soils for establishing vegetation; and, Drawing C-20 is revised to reference the use of tire chips around piping for various surface drainage applications. Note that this drawing set contains final grading drawings for all landfill cells.

1.H.7.b. The Operations Manual contained in Permit Module II is revised in accordance with a request for a minor amendment submitted on behalf of SPSA by Ms. Tanya Bray in her letter dated November 6, 2006. The plan incorporates the use of gray soils as an option for alternant daily cover. The material was approved for a 180-day demonstration period in March 2006. During the period the material proved to be an effective substitute for soil as daily cover as referenced in an October 24, 2006 memorandum from the landfill superintendent Mr. Jeff Ford. The revised operations manual also updates emergency contact information, reporting forms and other dated information to accurately reflect current operations at the landfill. This manual replaces the manual currently in the permit, revision date October 2005, with the version last revised November 2006.

I.H.7.c. The Unauthorized Waste Control Plan contained in Permit Attachment II-1 is revised in accordance with a June 9, 2006 notice from Ms. Amy Hardy that the plan has been updated. The plan was revised to update contact information; incorporate definitions; expand the scope of inspection procedures and incident reporting requirements; added criteria for different types of drums; and, added an Out-of-State Waste Inspection Form. This updated plan as last revised June 2006 replaces in its entirety the current version in the permit last revised June 2004.

I.H.7.d. The Gas Monitoring Plan contained in Section 6.0 of the Operations Manual contained in Permit Module II is revised in accordance with a May 11, 2007 notice submitted by Ms Amy Hardy. In response to elevated levels of methane gas detected near Cell VI in gas probe GP-31, SPSA conducted an investigation and determined the elevated readings were due to buried organic materials located at a depth coinciding with the depth of the screened level of the well. Therefore, a replacement well, GP-31R has been installed in a location nearby that contains less organic material at depth. Figure 2 on page 6-9 was revised to reflect this new location.

I.H.7.e. The technical specification 02275, Alternate Soil Liner System, contained in Permit Attachment IIIA-1 is revised in accordance with a request for a minor amendment submitted on behalf of SPSA by Mr. Douglas DeCesare, P.E., of HDR Engineering, Inc. in his letter dated May 11, 2007. The specification has been revised to allow a non-plastic soil to be used as the soil component of the base liner system. The percent passing the No. 200 sieve was edited from greater than 20% to greater than 10% and the references to liquid limit and plasticity index were removed.

I.H.8. The permit is amended in accordance with a minor amendment request dated January 18, 2008, to incorporate changes into the specifications and CQA Plan to address certain departures from the plan during the construction of Cell VI, Phase 2. Permit Attachment IIIA-1 is hereby revised as follows:

I.H.8.a. Specification 02220, "Earthwork," is revised to allow the use of a 10-ton vibratory smooth drum loader to proof roll subgrade soils instead of the previously specified 20-ton pneumatic-tired.

I.H.8.b. Specification Section 02275, "Alternate Soil Liner System," references that the alternate soil liner material should have greater than 10% fines (i.e., finer than a No. 200 sieve). During construction a slightly more granular material was encountered and consequently one of the required three samples tested had only 8% fines. This specification should be revised if it expected that more of this material is likely to be used.

I.H.8.c. Specification Section 01060, "Special Conditions," references that a minimum friction angle of 26.6 degrees is required for each interface in the base liner design profile. This value is more appropriate for the closure cap design profile, which is on a 3:1 slope. The base liner is on a lesser slope of 4:1 so a less restrictive minimum friction angle of 17 degrees with a minimum adhesion of 30 lbs/sq. ft. is acceptable for the interfaces of the base liner design profile. Please revise the specification to differentiate the values as appropriate

I.H.8.d. Specification 02775, "High Density Polyethylene (HDPE) Membrane Liner," references minimum peel and shear strengths for geomembranes seaming. The minimum values apply to both extrusion welds and double fusion welds. The values for extrusion weld peel strengths have been relaxed slightly from 65 lb/in. to 52 lb/in. for a 40-mil HDPE extrusion weld and from 90 lb/in. to 78 lb/in. for a 60-mil HDPE. This change is allowable and is in accordance with industry standards and GRI Test Method GM19.

ATTACHMENT I-1
Permit Related Corres.

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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
5636 Southern Boulevard, Virginia Beach, Virginia 23462
(757) 518-2000 Fax (757) 518-2009
www.deq.virginia.gov

Doug Domenech
Secretary of Natural Resources

David K. Paylor
Director

June 8, 2011

Mr. Rowland Taylor
Executive Director
Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, Virginia 23320

RE: Final Issuance of Permit Amendment
SPSA Regional Landfill, **Permit #417**
Cell VII Landfill Expansion
Suffolk, Virginia

Dear Mr. Taylor:

Attached is amended Permit #417 for the Cell VII expansion of the SPSA Regional Landfill in Suffolk. The public comment period ended on Friday, April 15, 2011. The department did receive public comments on the draft permit. However, no changes to the draft permit were made as a result of the public comment. A public comment response document was sent to all commenters on Friday, June 3, 2011.

The following changes to the draft permit have been made:

1. Per HDR Engineering's request submitted on behalf of SPSA on April 7, 2011, Condition I.F.4 has been modified to state: "Additionally, if the groundwater level exceeds the uppermost elevation of the screened interval of a monitoring well due to aquifer recovery following decommissioning of dewatering pumps, the facility shall be responsible for reconstructing the monitoring well to meet the requirements of VSWMR 9 VAC 20-80-300.A.3.c and A.3.e."

2. The tentatively approved variance for an alternate liner design for Cell VII contained in the draft permit has been removed from the final permit because the proposed

alternate liner design is now incorporated into the VSWMR at 9 VAC 20-81-130.J.1.b.

3. Other incidental editing and typographical corrections have been completed

This permit incorporates by reference the design and construction information for the Cells I through VI contained in the existing permit. Therefore, please do not discard your existing copy of Solid Waste Permit #417 as the SPSA will need to reference it to obtain information about these Cells in the future. Additionally, all copies of the previously distributed draft Cell VII permit must be updated with the attached final documentation.

The Virginia Department of Health - Office of Drinking Water has recommended that the public water well on the property be sampled for Volatile Organic Compounds (VOCs) and semi-volatile compound constituents to ensure the quality of the water. Please contact Office of Drinking Water Southeast Virginia Filed Office at (757) 683-2000 for guidance.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate an appeal of this decision, by filing notice with:

David K. Paylor, Director
Virginia Department of Environmental Quality
ATTN: Land Protection and Revitalization Division
P.O. Box 10009
Richmond, Virginia 23240-0009

In the event that this decision is served to you by mail, three days are added to that period. Please refer to Part Two of the rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specification of the Circuit Court to which an appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

It is the responsibility of the SPSA to obtain any other permits or authorizations that may be necessary. If there are any questions, please do not hesitate to contact Mr. Don Brunson at (804) 698-4239 or Mr. Milton Johnston at (757) 518-2151.

Sincerely,

Maria R. Nold
Acting Regional Director

Attachments

cc: Douglas DeCesare, PE (w/attachments)
Project Engineer
HDR Engineering Inc.
3733 National Drive, Suite 207
Raleigh, NC 27612

Scott Whitehurst, SPSA (w/attachments)
Milton Johnston, TRO, DEQ (w/ attachments)
Don Brunson, TRO/CO, DEQ (w/o attachments)

J. Wesley Kleene, PhD, PE, Director (w/o attachments)
Office of Drinking Water
Virginia Dept. of Health
Madison Building
109 Governor Street, 6th Floor
Richmond, VA 23219

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Doug Domenech
Secretary of Natural Resources

David K. Paylor
Director

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 417

Facility Name: Southeastern Public Service Authority Regional Landfill

Facility Type: Sanitary Landfill **Latitude:** 36°45'19" North

Site Location: Suffolk, Virginia **Longitude:** 76°31'36" West

Location Description: The facility is located on an 833 acre parcel off of the merged U.S. Routes 58, 13, and 460, approximately 2.5 miles southwest of the City of Chesapeake city limits in Suffolk, Virginia. Woods and Routes 58, 13, and 460 bound the site. Sole access to the site is provided by Bob Foeller Drive.

Background: The existing site has served as a sanitary landfill primarily for the Cities of Suffolk, Chesapeake, Virginia Beach, Norfolk, Portsmouth, and Franklin and the Counties of Isle of Wight and Southampton since permitting by the Department of Health on September 12, 1983. SPSA may receive waste from areas outside the primary service area. Solid waste will be delivered to the site by road. The waste accepted will conform to those wastes listed in Permit Module II, Operation Manual. The total site property encompasses 833 acres. The facility boundary (376 acres) and the waste management unit boundary (244 acres) are limited to those areas identified as the "Facility Boundary" and "Waste Limits" respectively, on the map entitled "Near-Vicinity Map" included in the NOI and Part A application. The facility boundary and the waste management unit boundary cannot be changed without an amendment to the Part A application. Existing Cells I through IV consists of approximately 103 acres of lined disposal footprint with a capacity of approximately 12.2 million cubic yards (9.4 million tons), which was deemed to be closed on September 21, 2009. Existing Cell V consists of approximately 43.6 acres of lined disposal footprint with a capacity of approximately 6.1 million cubic yards (4.7 million tons). Existing Cell VI consists of approximately 41 acres of lined disposal area with a capacity of approximately 8.9 million cubic yards (6.8 million tons). This amendment to incorporate Cell VII permits an additional 56 acres of lined disposal area with a capacity of approximately 10.8 million cubic yards with an estimated site life of approximately 5.9 years and with the remaining capacity in Cell VI will extend the life of the facility to the year 2018

Permit Limits: The landfill's daily maximum disposal limit is 7500 tons/day. The limit is based on the design, infrastructure, equipment, and staffing maintained by this facility.

Permit Highlights: This permit amends the existing permit which was last amended by a major permit amendment to incorporate Cell VI on November 7, 2005. This permit includes permit modules and associated permit attachments. The attachments consist of information submitted by the permittee. There are seven permit modules and associated permit attachments. Permit Module I includes general permit conditions. Permit Module II and its related attachments include information relating to the facility's operations. Permit Modules III, IIIA, IIIB, and IIIC and the related attachments detail the landfill design and construction information pertinent to the facility. Permit Module X and Permit Attachment X-1, include conditions related to groundwater detection monitoring at the facility. Permit Module XI and Permit Attachments XI-1, XI-2, and XI-3 contain conditions relative to groundwater assessment monitoring requirements. Permit Modules XII and XIII contain closure and post-closure care information for the facility. All permit modules and attachments are prepared based on information submitted in the permit application. The permit incorporates design elements for the use of an alternate liner design and a leachate collection and removal piping system.

Site Development Summary: When the facility was first permitted by the State Health Department on September 12, 1983, development plans included the design for Cells I through IV. Cell I opened in January 1985. For the first landfill expansion, a major permit amendment dated March 4, 1994 added Cell V, which brought the total disposal footprint at the landfill to 146.6 acres. This amendment also incorporated an active methane gas recovery and power generation system for Cells I-IV. This was the first permit issued in accordance with the Virginia Solid Waste Management Regulations (VSWMR) that became effective December 21, 1988. Prior to constructing Cell V, a major permit amendment was issued November 19, 1997 to incorporate the redesign of the base liner system of Cell V placed below the local groundwater table elevation. For the second landfill expansion, a major permit amendment dated November 7, 2005 added Cell VI, bringing the total lined disposal footprint at the landfill to approximately 188 acres. For the third landfill expansion, this major amendment permits Cell VII which incorporates an additional 56 acres of lined disposal area bringing the total lined disposal area to 244 acres. Similar to Cells V and VI, the Cell VII liner design is for a non-standard Subtitle D alternate liner installed below the water table. Note that with Amendment 7 of the VSWMR, a variance is no longer required to use this alternate liner. Leachate is discharged to a lagoon approximately 1.4 acres in size prior to on-site direct discharge to the HRSD sewerage system. With the construction of Cell VII a 500,000 gallon leachate storage tank shall be installed.

Permit Amendments: All major permit amendments are summarized in Section I.G of Permit Module I. All minor permit amendments are summarized in Section I.H of Permit Module I.

Variances: All previous variances are summarized in Permit attachment I-2

THIS IS TO CERTIFY THAT: Southeastern Public Service Authority
P.O. Box 1346
Chesapeake, Virginia 23320

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, IIIA, IIIB, X, XI, XII, and XIII and the associated Permit Attachments cited in these Modules. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board. Prior to issuing the permit, any comments by the local government and the general public have been investigated and evaluated and it has been determined that the proposed facility poses no substantial present or potential danger to human health or the environment. The permit contains such conditions and requirements as are deemed necessary to comply with the requirements of the Virginia Code, the regulations of the Board, and to prevent a substantial present or potential threat to human health or the environment.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended. Issuance of this permit also constitutes granting of the variances as referenced above.

ISSUED: September 12, 1983 (Department of Health Cells I through IV)
AMENDED: March 4, 1994 (Major for Cell V)
November 19, 1997 (Major for redesign of Cell V)
May 1, 2000 (Minor for Spec Change)
May 23, 2000 (Minor for acceptance of treated, but non-shredded medical waste)
November 14, 2000 (Minor for Spec Change)
November 21, 2000 (Minor for material substitution)
February 21, 2003 (Minor for closure cap design)
March 3, 2005 (Minor for Monitoring Well Subset)
November 7, 2005 (Major for Cell VI)
July 31, 2007 (Minor Consolidated Amendments)
March 4, 2010 (Minor for Spec Change)

APPROVED:

Signed: ______________________
Maria R. Nold
Acting Regional Director

Date: June 8, 2011
(Major)

PERMIT MODULES AND PERMIT ATTACHMENTS[1] REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS
PERMIT ATTACHMENT I-1 – PERMIT RELATED CORRESPONDENCE
PERMIT ATTACHMENT I-2 – GENERAL FACILITY INFORMATION AND VARIANCES
PERMIT ATTACHMENT I-3 – APPROVED SUBSET OF WELLS

PERMIT MODULE II[2] – OPERATIONS MANUAL
PERMIT ATTACHMENT II-1 -- UNAUTHORIZED WASTE CONTROL PLAN
PERMIT ATTACHMENT II-2 -- LFG POWER PLANT
PERMIT ATTACHMENT II-3 – PROCESS WATER MONITORING PLAN

PERMIT MODULE III – CELL VII DESIGN AND CONSTRUCTION
PERMIT ATTACHMENT III-1 -- DESIGN DRAWINGS
PERMIT ATTACHMENT III-2 -- TECHNICAL SPECIFICATIONS
PERMIT ATTACHMENT III-3 -- QA/QC DOCUMENTATION REQUIREMENTS

PERMIT MODULE IIIA – CELL VI DESIGN AND CONSTRUCTION[3]
PERMIT ATTACHMENT IIIA-1 -- DESIGN DRAWINGS
PERMIT ATTACHMENT IIIA-2 -- ALTERNATIVE LINER VARIANCE

PERMIT MODULE IIIB – CELL V DESIGN AND CONSTRUCTION[3]
PERMIT ATTACHMENT IIIB-1 -- DESIGN DRAWINGS
PERMIT ATTACHMENT IIIB-2 -- ALTERNATIVE LINER VARIANCE

PERMIT MODULE IIIC – CELLS I THROUGH IV DESIGN DRAWINGS[3]
PERMIT ATTACHMENT IIIC-1 -- DESIGN DRAWINGS

PERMIT MODULE X -- DETECTION GROUNDWATER MONITORING
PERMIT ATTACHMENT X-1 -- GROUNDWATER MONITORING PLAN

PERMIT MODULE XI -- ASSESSMENT GROUNDWATER MONITORING

PERMIT MODULES XII AND XIII[2] -- CLOSURE AND POST-CLOSURE CARE
PERMIT ATTACHMENT XII-1 -- LANDFILL CLOSURE PLAN
PERMIT ATTACHMENT XIII -1 -- POST-CLOSURE PLAN

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with any requirement or condition contained in the permit modules I, X, XI, or 9 VAC 20-80 (VR 672-20-10), the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for

spelling, typographical, or syntax errors in modules based on information submitted by the permittee.

2. The Emergency/Contingency Plan, or the Closure and Post-Closure Plan may be revised with Department approval.

3. Cells I through VI have been constructed prior to the major permit amendment to incorporate the Cell VII expansion. Cells V and VI specifications and quality assurance and control plans are incorporated by reference. These documents and associated QA/QC construction reports must be maintained in the facility operating record throughout the facility life and post-closure period.

ATTACHMENT I-2
Facility Information

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ATTACHMENT I-3

Approved Well Subset

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MJ
Stan

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.state.va.us

Robert G. Burnley
Director

(804) 698-4000
1-800-592-5482

March 3, 2005

Ms. Amy Hardy
Environmental Compliance Coordinator
Southeastern Public Service Authority (SPSA)
P.O. Box 1346
Chesapeake, Virginia 23320-1346

MAR 2005
RECEIVED
DEQ TIDEWATER
REGIONAL OFFICE

RE: SPSA Regional Sanitary Landfill, Permit Number 417
Well Subset Request

Dear Ms. Hardy:

This letter is a reply to your correspondence, dated December 10, 2004, in which your consultant, SCS Engineers, petitioned that a subset of wells be established for the facility assessment monitoring program as allowed under VSWMR 9 VAC 20-80-300 B.3.b. The petition is based on analytical data indicating that no statistically significant increases (SSI) over background for constituents have been observed in monitoring wells MW10, MW-15, and MW-16.

The Department hereby grants the facility's petition to monitor a subset of wells during the assessment monitoring program. The assessment monitoring constituents (Table 5.1) must be monitored at least annually at wells included in the subset (MW-11, MW-12, MW-19, and MW-21), in accordance with the regulations. The remaining wells (MW10, MW-15, and MW-16) are to monitor the Table 5.5 detection monitoring constituents. New compliance monitoring wells that were installed in August 2004 (MW-4R, MW-22R, MW-24, MW-25, MW-26, MW-27, MW-28, MW-29, and MW-30) as part of the facility expansion are also excluded from the subset requiring assessment monitoring. If any aforementioned well (MW10, MW-15, MW-16, MW-4R, MW-22R, MW-24, MW-25, MW-26, MW-27, MW-28, MW-29, and MW-30) observes a SSI, then the same well(s) must also begin monitoring all the Table 5.1 constituents annually.

Also, monitoring wells MW-4, MW-17, MW-18, MW-20, and MW-22 are being removed from the monitoring network in conjunction with the pending major permit amendment for construction of Waste Cell VI. The replacement of these wells in the compliance monitoring well network will be allowed following concurrence by the department statistician, Hasan Kecili, that there have been no SSI's within these wells (attached). They may be excluded from the assessment subset and monitored only for Table 5.5 constituents until such time that they are replaced and abandoned.

Creation of a subset of wells requires a minor permit amendment; however, the pending major permit amendment will incorporate the well subset creation in addition to other changes made to current groundwater modules. These new modules will be supplied following Part B approval of the major permit amendment.

Please note that creation of a well subset does not require a variance to the Virginia Solid Waste Management Regulations as indicated in your petition; therefore, public notification and associated fees are not necessary to grant the request. If you have any questions concerning the granted petition, please do not hesitate to contact Mason Pritchett at (804) 698-4039.

Sincerely,

Leslie A Romanchik

f Robert G. Burnley

cc: Howard Freeland, DEQ-CO
Milt Johnston, DEQ-TRO
Bradley C. Blase, SCS Engineers

DEQ

Department of Environmental Quality

OFFICE OF WASTE PROGRAMS

MEMO

TO: Mason Pritchett

FROM: Hasan Keceli H.K.

DATE: February 3, 2005

CC: Howard Freeland
Sanjay Thirunagari

SUBJECT: Review of Variance Petition Report for SPSA Regional Sanitary Landfill, Permit # 417

Per your request, I have reviewed the Variance Petition report for the Southeastern Public service Authority Regional Sanitary Landfill.

Based on my review of the laboratory sheets for sampling event results, the Department concurs with the facility's conclusion that there have been no table 5.5 organic compounds quantified at the site for wells MW-4, 17, 18, 20, and MW-22 at the site.

If the facility has any questions regarding this memorandum, I can be reached at (804) 698-4246.

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MODULE II

Operations Manual

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SPSA

Southeastern Public Service Authority of Virginia

Regional Landfill Operations Manual

Revised for Cell VII Expansion
August 2008
Revised May 2010
Revised July 2010
Revised December 2010

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SPSA Document Management Form
Records of Revisions

Document Name: *Regional Landfill Operations Manual*

Written By: Tanya C. Bray Dept.: DESM

Original Date of Issuance: August 12, 2002 Last Revised: December 2010

Revision No.	Revision Date	Made By	Revision Description (Include Page #'s as Applicable)	Received By
1	11/3/06	TCB	• § 1.1 on Page 1-Updated facility throughput with FY 05-06 tonnages	
			• § 3.2 on Pages 5 & 6—added Table 2, Employee Training Requirements	
			• § 4.3 on Page 15—Updated Table 3, Landfill Equipment & Personnel Requirements	
			• § 4.5 on Page 21—added 2.B.6 section on non-hazardous contaminated soil ADC	
			• § 5.7 on Page 25—added reference to Handbook of Safety Policy Directives	
			• § 7.1 on Page 40—added daily weather forecasts as one of items checked during daily inspections	
			• § 9.8 on Page 51—added Table 8, Landfill Emergency Equipment	
			• § 9.10 on Page 52—added Table 9, Emergency Plan Dissemination Locations	
			• Updated Emergency Contact Sheet on Pages 53 and 54	
			• Appendix B—updated checklists • Daily Inspection Checklist • Load Checking Inspection Report • Quarterly Safety Inspection • Quarterly Environmental Inspections	
2	8/2008	HDR	• Revised for Cell VII Permit Application	
3	5/2010	HDR	• § 3.1 on Page 6—revised number of staff positions in Table 1, Regional Landfill Operating Staff	
			• § 4.2.3 on Page 12—added reference to Appendix H, Odor Control Plan	
			• § 4.3 on Page 16—revised number of staff positions in Table 3, Typical Major Landfill Equipment and Personnel Needs by Daily Tonnage	
			• § 6.2 Landfill Gas Monitoring and Control on pages 33 – revised to state that action is now required if the monitored levels of methane gas reach 80% of the LEL at the facility boundary.	
			• Added Appendix H – Odor Control Plan	

Revision No.	Revision Date	Made By	Revision Description (Include Page #'s as Applicable)	Received By
4	7/8/2010	HDR	• § 6.2 Landfill Gas Monitoring and Control on pages 33 – revised reference to cite Permit Attachment II-2.	
			• Appendix H – Odor Control Plan, Part III-Gas Control System - revised to describe expansion of existing gas control system into Cell VI	
5	12/2010	HDR	• § 6.2.7 Landfill Gas Recovery System on Pages 37/38 – revised to describe collection process by landfill area. • Updated contact information on Emergency Call Sheet and Quarterly Environmental Inspection Report • Appendix E - updated Disclosure Statements	

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FIGURES AND TABLES

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APPENDICES

SECTION 1.0
INTRODUCTION

1.1 GENERAL

This Operations Manual describes the operation of the Regional Landfill (Landfill) located in the City of Suffolk (City), Virginia. The Landfill is an integral component of the Southeastern Public Service Authority's (SPSA) integrated solid waste management system. During its 2007-2008 fiscal year (FY), SPSA disposed of ***approximately 1,200,000*** tons of solid waste at the Landfill.

SPSA's Landfill provides for the safe disposal of municipal, commercial, and certain special non-hazardous solid waste generated within the communities of Chesapeake, Franklin, Isle of Wight, Norfolk, Portsmouth, Southampton, Suffolk, and Virginia Beach. Hazardous wastes are **not** acceptable at any SPSA facility. The service area is comprised of approximately 1.2 million people, generating approximately one million tons of waste annually. A service area map is included as Figure 1.

1.2 PURPOSE

This Operations Manual has been prepared in accordance with the Virginia Department of Environmental Quality's (VDEQ) Solid Waste Management Regulations (VSWMR) (9 VAC 20-80), and is to be used as an on-site reference document for facility operators and employees.

1.3 ORGANIZATION

The Operations Manual is organized as follows:

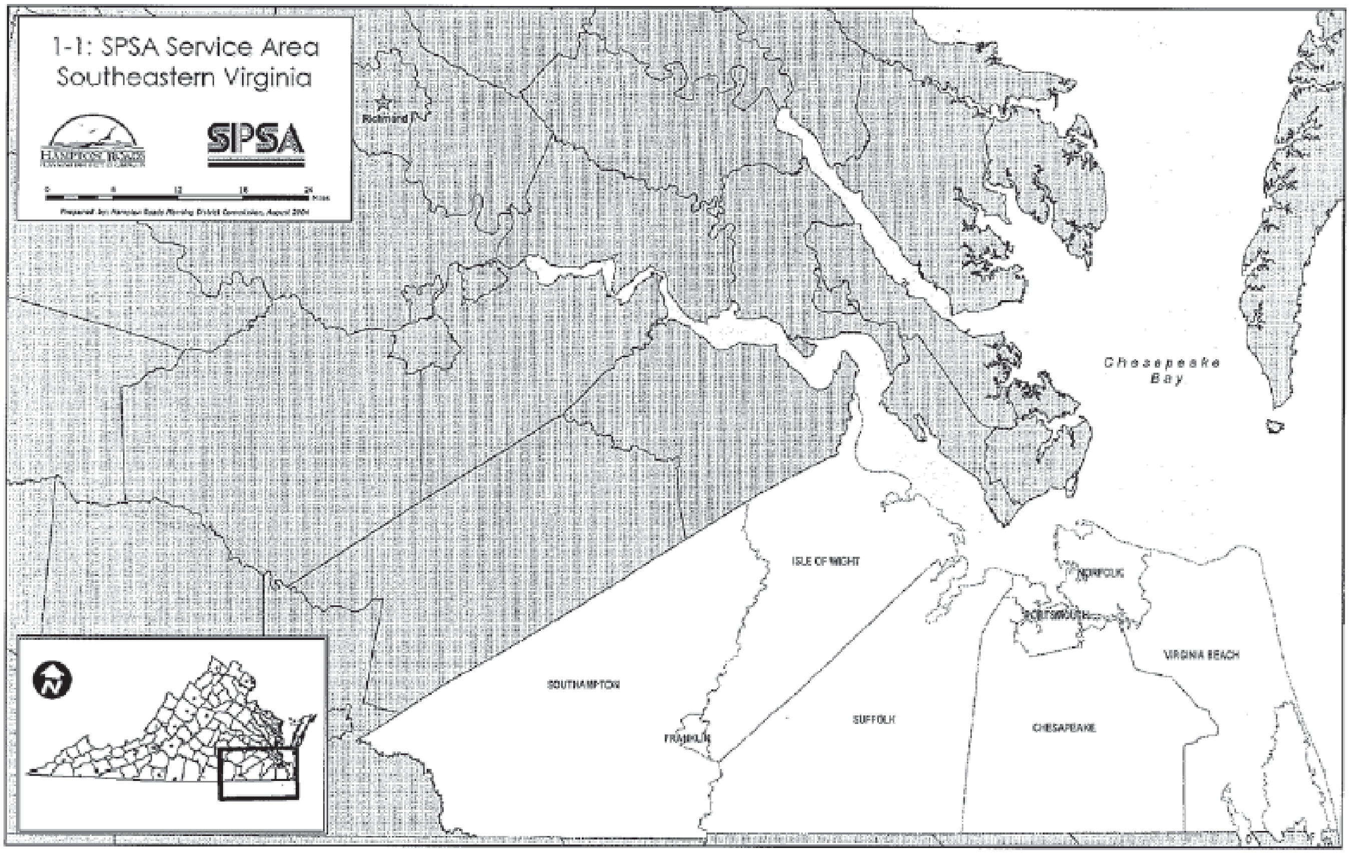
1.0 Introduction
2.0 Site and Service Information
3.0 Personnel Requirements
4.0 Operational Conditions
5.0 Safety Plan
6.0 Control and Monitoring of Liquids and Gases
7.0 Inspection Plan
8.0 Regional Landfill Contingency Plan
9.0 Regional Landfill Emergency Plan

1.4 REVIEW AND AMENDMENTS TO THE OPERATIONS MANUAL

The contents of this Operations Manual are reviewed and amended on an as-needed basis, but no less frequently than bi-annually, to ensure it reflects the most current operations of the Landfill.

Figure 1

Service Area Map



SECTION 2.0
SITE AND SERVICE INFORMATION

The Landfill is located on an 833-acre parcel off of U.S. Route 58, approximately 2.5 miles southwest of the Chesapeake city limits. A site vicinity map is included as Figure 2. The following structures/facilities are also located on the Landfill site:

- Bi-Metals Ferrous Metal Processing Plant
- SPSA Tire Processing Facility
- U.S. Energy Landfill Gas-to-Energy Plant
- Soilex Corporation Soil Remediation and Treatment Facility
- Administration/Maintenance Building
- Household Hazardous Waste Collection and White Goods Facility
- Vehicle and Equipment Wash Facility
- Leachate Pond and Pump Station
- Citizens' Drop-Off Area
- Scalehouse
- Transfer Station

SPSA transfer vehicles, and municipal, commercial, and residential haulers deliver waste to the Regional Landfill. Non-processable waste from the Refuse Derived Fuel (RDF) Plant, in Portsmouth, Virginia, is also disposed of at the Landfill. Hazardous wastes are not accepted at the Landfill. Other waste types deemed to be unacceptable at the landfill include but are not limited to:

- Free liquids
- Regulated medical waste
- Unapproved industrial process waste
- Materials containing friable asbestos
- Polychlorinated Biphenyl (PCB) containing materials

A more complete list of unacceptable waste may be found in Section 4.2.1.B of this Operations Manual. SPSA reserves the right to establish and enforce acceptance criteria and procedures for certain non-hazardous industrial and special wastes. These criteria may be more stringent than required by law or regulation based on waste stream characteristics and quantities. Acceptability is based solely on the discretion of SPSA's Board of Directors, Executive Staff, and Landfill Management.

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Wetland Classification determined by U.S. Fish and Wildlife Service recorded in the National Wetland Inventory and published in April 1990. Cell VII Wetlands provided by U.S. Army Corps of Engineers Norfolk District published in Environmental Impact Statement dated May 1995

Data Sources: First Dataset – Source, YYYY; Second Dataset – Source, YYYY | \\CLT\GIS\GISProjects\ | Last Updated: MM-DD-YYYY

HDR ONE COMPANY | *Many Solutions*

- Proposed Facility Boundary
- Existing Facility Boundary
- Existing Cell Waste Limits
- Property Boundary
- 500 ft Buffer Around Property
- Proposed Cell VII Waste Limits
- Gas Pipeline Easement
- Private Water Supply Well
- Railroad
- Water Fire Hydrant
- Power and Telephone Poles
- Electric Transmission Towers
- Electric Transmission Lines
- Hydrography
- Swamps and Marshes
- Communication Towers
- Building Footprint
- Parcels
- 100 year Flood Boundary
- 10 ft Topography
- Recreational facilities
- Wetlands
- Federally Owned Land

* The SPSA Regional Landfill is within the boundary of the Great Dismal Swamp "Special Flood Hazard Area", "inundated by 100-Year flood", Zone A (no base flood elevations determined). However, 100-year base flood elevations were determined utilizing ICPR 3.0, an unsteady model appropriate for low slope, storage-based hydrologic and hydraulic sites. The 100-year base flood elevations determined indicated Cell VII is not within a 100-year floodplain. A letter of Map Revision (LOMR) is being submitted to FEMA to remove the Cell VII area from the flood zone.
(see attached copy of FEMA Flood Insurance Rate Map)

Map data provided by City of Suffolk GIS Department:
tax parcel information, land use and zoning information, planimetric base data, and environmental information

Map data provided by USDA FSA AFPO:
2006 National Agriculture Imagery Program orthotography

No parks, recreation areas, dams, historic areas, monument areas, cemetaries, or unique areas exist within the 500 ft Facility Buffer

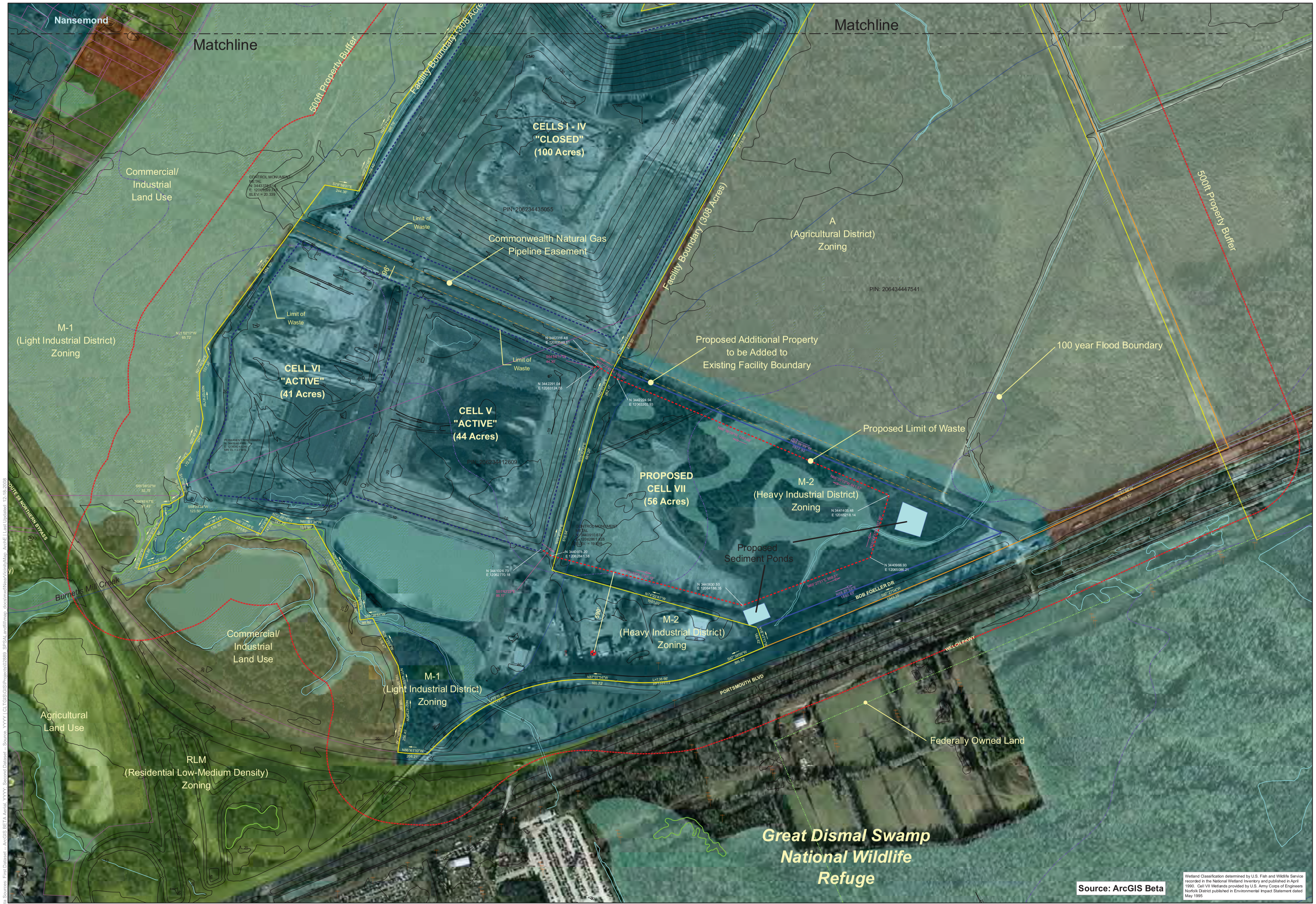
N
W E
S

0 200 400 Feet
1 inch equals 200 feet

July 2003
Revised August 2007

Near Vicinity Map
Drawing No. 4

SPSA Regional Landfill | Cell VII Addition | Near Vicinity Map



Source: ArcGIS Beta

Wetland Classification determined by U.S. Fish and Wildlife Service recorded in the National Wetland Inventory and published in April 1990. Cell VII Wetlands provided by U.S. Army Corps of Engineers Norfolk District published in Environmental Impact Statement dated May 1995

Data Sources: First Dataset -- ArcGIS BETA Aerial, YYYY; Second Dataset -- Source, YYYY | CLTGIS\GIS\Projects\02889_SPSALandfill\map_docs\mxd\NearVicinityMap_ArchE | Last Updated: 12-18-2008

HDR
ONE COMPANY | *Many Solutions*™

- Proposed Facility Boundary
- Existing Facility Boundary
- Property Boundary
- 500 ft Buffer Around Property
- Existing Cell Waste Limits
- Gas Pipeline Easement
- Proposed Cell VII Waste Limits
- Private Water Supply Well
- Railroad
- Water Fire Hydrant
- Power and Telephone Poles
- Electric Transmission Towers
- Electric Transmission Lines
- Parcels
- Hydrography
- Swamps and Marshes
- Communication Towers
- Building Footprint
- Federally Owned Land
- 100 year Flood Boundary
- 10 ft Topography
- Recreational facilities
- Wetlands

* The SPSA Regional Landfill is within the boundary of the Great Dismal Swamp "Special Flood Hazard Area", "inundated by 100-Year flood", Zone A (no base flood elevations determined). However, 100-year base flood elevations were determined utilizing ICPR 3.0, an unsteady model appropriate for low slope, storage-based hydrologic and hydraulic sites. The 100-year base flood elevations determined indicated Cell VII is not within a 100-year floodplain. A letter of Map Revision (LOMR) is being submitted to FEMA to remove the Cell VII area from the flood zone.
(see attached copy of FEMA Flood Insurance Rate Map)

Map data provided by City of Suffolk GIS Department:
tax parcel information, land use and zoning information, planimetric base data, and environmental information

Map data provided by USDA FSA AFPO:
2006 National Agriculture Imagery Program orthotography

No parks, recreation areas, dams, historic areas, monument areas, cemetaries, or unique areas exist within the 500 ft Facility Buffer

N
W E
S

0 200 400 Feet
1 inch equals 200 feet

July 2003
Revised August 2007

Near Vicinity Map
Drawing No. 4

SPSA Regional Landfill | Cell VII Addition | Near Vicinity Map

SECTION 3.0
PERSONNEL REQUIREMENTS

3.1 LANDFILL OPERATING STAFF

The personnel required to operate the Landfill is listed in Table 1.

Table 1
Regional Landfill Operating Staff

Position Title	Number of Positions
Landfill Superintendent	1
Landfill Supervisors (I & II)	2
Heavy Equipment Operators	2-8
Scale Attendant (I & II)	2
Solid Waste Assistants	5
Equipment Mechanic Custodian	2
TOTAL	14-20

Historical and forecasted waste quantities determine staffing requirements for the Landfill, which are increased as necessary to operate the Landfill in a safe and efficient manner. Additional staff may be hired intermittently for grounds maintenance and other miscellaneous needs.

3.2 EMPLOYEE TRAINING

All SPSA employees are properly trained to familiarize them with SPSA's operations and policies to enable them to perform their job safely and competently. At the time of hire, all employees must attend New Hire Orientation where they are provided information concerning SPSA's organizational structure, safety guidelines and employees rights. Each employee is also provided on-the-job training by the supervisor of his/her work site. This training contains more detailed information specifically related to the employee's position including: employee responsibilities and accountabilities; work schedules; site specific safety requirements and corresponding disciplinary actions for violation of safety rules; emergency response procedures and evacuation plans. Additionally, employees are familiarized with SPSA's Unauthorized Waste Exclusion Policy, which includes how to recognize unauthorized wastes, and the procedures to follow if these waste are detected at a SPSA facility. Additionally, all SPSA personnel on site are trained on SPSA's Environmental Management System, and associated Standard Operating Procedures related to their work duties. This training is updated on an annual basis. SPSA's employee training requirements are summarized in Table 2 below.

Table 2
SPSA Employee Training Requirements

Training Description	Performed by	Received by	Training Frequency
Environmental Awareness Training	DESM Staff	All Employees	Annually
Emergency Response Training	Safety Department	All employees	Annually
EMS Awareness Training	EMS Coordinator; Supervisors	New employees Tenured employees	Upon Hire At least annually
EMS SOP Training	Supervisors	All employees	Within 30 days of Hire; Annually thereafter
New Hire Orientation	Human Resources	All new employees	Upon Hire
Stormwater Pollution Prevention Training	DESM Staff	RDF Plant and Regional Landfill Employees	Annually
Unauthorized Waste Control Plan	Supervisors DESM Staff	New employees Tenured employees	Upon Hire At least annually

3.3 DISCLOSURE STATEMENTS

VSWMR require facility operators to submit Disclosure Statements for Key Personnel at solid waste management facilities. SPSA's Key Personnel for the Landfill include its Executive Staff, Landfill Superintendent, and Landfill Supervisor II. Disclosure Statements for these individuals may be found in Appendix E of the Operations Manual.

3.4 OPERATOR CERTIFICATION

SPSA's Landfill Supervisor II, Landfill Superintendent, and other Facility Operators have received Class II Operators licenses from the Virginia Board of Waste Management Facility Operators. Each licensed operator is responsible for ensuring that the facility is operated in compliance with applicable regulations. At least one licensed operator will be present on-site during all hours of operation.

SECTION 4.0
OPERATIONAL CONDITIONS

4.1. SITE ACCESS

4.1.1 Hours of Operation

This Landfill is permitted to operate on a 24 hours per day, seven days per week schedule. The Landfill disposal area is open to the general public during the following time periods:

Monday through Friday: 7:30 a.m. to 4:00 p.m.
Saturday: 7:30 a.m. to 12:00 p.m.
Sundays and major holidays: Closed

SPSA vehicles deliver waste to the Landfill on a 24-hour basis and certain contracted customers may deliver waste before or after normal hours of operation. The citizens' disposal area is open from 7:00 a.m. to 5:00 p.m., seven days per week. The hours of operation for the Household Hazardous Waste Collection Facility are 8:00 a.m. to 4:00 p.m. Tuesday through Saturday.

SPSA periodically evaluates the operating hours of all facilities to accommodate special circumstances and needs of member communities. These may include holiday closings, reduced operating hours for facility maintenance and repairs, or other reasons. Notices are posted at least one week in advance at the main entrance advising users of any special operating hours or holiday closings.

4.1.2 Entrance to the Facility

Access to the site is limited to a single public access point from Route 58. The site entrance is equipped with vehicular gates that are closed and locked during non-operating periods. SPSA also employs security guards to patrol the site during non-operating hours. During operating hours, the scale attendant controls access to the site and conducts initial waste screenings to determine their acceptability at the Landfill. SPSA also employs trained Environmental Specialists who perform random inspections of incoming waste loads. This inspection program is further described in the Inspection Plan in § 7.3 of this Operations Manual.

4.1.3 Traffic Routing

Access roads to the entrance of the site and disposal area are all weather finished with gravel or asphalt. Minimization of fugitive dust and mud deposits on off-site and main access roads is accomplished by:

- Use of the truckwash facility to prevent vehicles exiting the facility from tracking mud picked up from the disposal area; and
- Periodic sweeping on an as-needed basis of main access road.

Internal roads are kept passable by ordinary vehicles in all weather conditions. The roads are slightly sloped to prevent ponding of water during periods of heavy rain. During icy conditions, the roads are covered with sand and/or salt. Blown litter and debris are picked up on a daily and as-needed basis. Parking is available for visitors and employees in the lot behind the Administration/Maintenance Building. All traffic exiting the Regional Landfill must turn right onto US 58 West. East bound traffic must use the loop ramp located 3,000 feet to the west.

4.1.4 Inclement Weather Operations

The following measures are taken to ensure safe operation of the Landfill during inclement weather conditions:

A. Windy Weather

Temporary fencing is placed near the working face of the fill area during windy conditions. Cover material is applied more frequently during periods of high wind. During periods of excessively high wind, operations may be either temporarily suspended or relocated to a more enclosed, shielded area.

B. Wet Weather

Routine road maintenance and repairs are performed to facilitate safety during wet weather conditions. Sediment and debris occurring in drainage ditches due to soil erosion during periods of heavy rainfall are cleared as soon as weather conditions permit. During periods of heavy rain, unloading areas are graded to allow for run-off, and stockpiles are sloped and compacted.

C. Cold Weather

All roads are kept clear of ice and snow during severely cold and/or snow weather. Stockpiles are cut and stripped periodically when cover soil freezes.

4.2 WASTE HANDLING PROCEDURES

4.2.1 Types of Wastes

A. Acceptable Waste Types

Virginia's Solid Waste Management Regulations allow the following waste types to be accepted at the Regional Landfill:

- Agricultural waste.
- Ashes and air pollution control residues not classified as hazardous waste.
- Commercial waste.
- Compost.
- Construction waste.

- Debris.
- Demolition waste.
- Discarded material.
- Garbage.
- Household waste.
- Special waste*.
- Inert waste.
- Industrial wastes meeting specified criteria
- Institutional waste.
- Properly treated medical waste as defined by Regulated Medical Waste Disposal Regulations (9 VAC 20, Chapter 120).
- Municipal solid waste (MSW).
- Non-friable asbestos with prior approval.
- Non-regulated hazardous wastes and treated wastes rendered non-hazardous by specific approval only.
- Transfer Station wastewater to be disposed of in the landfill leachate lagoons and discharged to HRSD.
- Putrescible waste.
- Refuse.
- Residential waste.
- Rubbish.
- Scrap metal.
- Sludge -- Water treatment plant (WTP) sludge containing no free liquid and stabilized, digested, or heat treated waste WTP sludge containing no liquid may be placed on the working face along with MSW and covered with soil or MSW.
- Trash.
- Unshredded, treated medical waste.
- Vegetative waste
- Waste oil that has been adequately absorbed in the course of a site cleanup
- White goods*.
- Yard waste

*__Special waste - see § 4.2.9__

B. Unacceptable Waste Types

The Landfill accepts only municipal and commercial solid waste generated within the cities of Chesapeake, Franklin, Norfolk, Portsmouth, Suffolk, and Virginia Beach and the Counties of Isle of Wight and Southampton. Any materials which pose a health hazard, fire hazard, or which can negatively impact the environment or landfill operations are unacceptable. Regulated hazardous and medical wastes are not accepted at this facility. The Regional Landfill may not receive the following wastes:

- Free liquids that include bulk or non-containerized liquid waste ***unless*** the waste is household waste or the waste is leachate or gas condensate derived from the landfill.
- Containers holding liquid waste ***unless*** the container is a small container similar in size to that normally found in household waste, the container is designed to hold liquids for use other than storage or the waste is household waste.
- Unstabilized sewage or dioxins sludge(s) that have not been de-watered.
- Pesticide containers that have not been triple rinsed and crushed.
- Drums that are not empty, properly cleaned, and opened.
- Contaminated soil containing more than 500 parts per million (ppm) Total Petroleum Hydrocarbons, 100 ppm TOX, or 10 ppm BTEX.
- Large animal carcasses.
- Slaughterhouse waste.
- Unapproved industrial process waste.
- Cable, wire, rope, etc, exceeding 6 feet in length.
- Rigid items over 6 feet in length, including but not limited to; pipe, timber, metal stock, construction materials, etc.
- Materials containing friable asbestos.
- Waste materials containing more than 50 ppm PCBs.
- Wastes, residues or soils containing more than 1.0 part per billion (ppb) of dioxins.

C. Unauthorized Waste Control Plan

SPSA takes every effort to ensure that unauthorized wastes are not accepted into its disposal system. As such, SPSA has developed an Unauthorized Waste Control Plan to help employees identify and respond to the disposal of unauthorized wastes at SPSA's facilities. A copy of this plan is available at all SPSA facilities and employees receive training on its contents upon hire and in annual increments thereafter. The Unauthorized Waste Control Plan can be found in Attachment 1 of this module. (Module II A-1)

4.2.2 Litter Control

All solid waste is compacted as soon as practicable after it is unloaded. The working area is kept as small as practicable in order to reduce the potential for blowing debris. Portable fences are placed in the vicinity of and downwind from working areas to catch blowing litter. Landfill personnel pick up litter that has escaped from the working face on a daily and as-needed basis.

4.2.3 Odor, Vector, and Noise Control

Odors emitted from the solid waste as it is deposited in the Landfill are normally limited to areas within a short distance of the working face. Covering of the waste in a timely manner aids to prevent odor from becoming a nuisance. Leachate, another potential source of odor, is collected and removed off-site continually via a force main. This further reduces potential odor problems. The lagoons are located in a remote area of the site and are constantly aerated to prevent stagnation. The Landfill is equipped with an active methane gas collection system that collects landfill gas and converts it to electrical energy. U.S. Energy Biogas Corporation, a private contractor, operates the Landfill Gas-to-Energy facility at the Landfill. In the event odors become a problem, landfill staff will follow the Odor Control Plan provided in Appendix H.

In addition to the application of daily cover at the end of each day, rodent and vector control is affected by the immediate covering of putrescible waste as soon as it is deposited. If infestations do occur, control measures such as trapping are implemented.

Noise is not a nuisance problem to surrounding citizens or to the administrative function at the Landfill. Processing equipment is required to have a sound level-measured 5 feet from the equipment not to exceed 85 decibels. A buffer of trees and other vegetation has been maintained between the operating areas and the closest residential areas. Operating personnel are trained in the use of equipment to minimize noise generation and are also provided with appropriate hearing protection to prevent hearing loss.

4.2.4 Open Burning

Open burning is not permitted at the Landfill.

4.2.5 Placement of Waste in State Waters

Solid waste is not deposited in, nor is it permitted to enter, any surface waters or ground waters at or near the Landfill.

4.2.6 Salvaging

Salvaging is permitted by the Facility Operators only and strictly controlled at the Landfill. Salvage items are set-aside in designated areas for recycling purposes only. They are stockpiled and maintained in a neat and orderly fashion at all times. Scavenging by the public is prohibited at the Landfill.

4.2.7 Filling Operation

A. Cell VII - Initial Lift

The first lift of waste will be placed using special methods in order to protect the liner from damage. No disposal vehicles will be allowed to drive directly on the liner/leachate collection system. Soil platforms will be developed near the working face during initial placement of waste. The initial lift of waste will be only 10 feet high and compacted. Landfill personnel have been trained to keep bulky waste that could damage the liner out of the first lift. Daily cover will be applied as required. After the first lift has been completed, normal filling procedures will begin. The filling sequence of Cell VII is displayed on Sheets C-4 and C-5 of the design plans. The size of the working face and daily Cell VII lifts are described in § 2.9.1 of the Design Report.

B. Normal Filling Operation

Maintenance procedures are implemented to assure proper application of cover material and control of soil erosion. The width of the working face is minimized as practical in order to reduce litter and bird problems and reduce the cover volume requirements. However, the size of the working face must be large enough to allow for safe and efficient vehicle traffic flow. A width of 500 feet is sufficient to allow for safe operations.

To construct each cell properly, waste must be spread and compacted with a bulldozer and/or compactor. Spreading is done in order to distribute the waste evenly across the working face, while compaction helps save landfill space and reduces potential for litter problems.

4.2.8 Daily Cleanup

The working face of the Landfill is maintained throughout the day so that litter does not create a nuisance. Daily cover material is placed atop the working face as required by regulation. Litter blown onto non-disposal areas is picked up on a daily and as-needed basis.

4.2.9 Special Wastes

VSWMR defines special wastes as those solid wastes that are difficult to handle, require special precautions because of hazardous properties, or the nature of the waste creates management problems. VDEQ must approve special wastes that are not included in the facility permit prior to disposal. The following describes waste handling procedures utilized for the below listed special waste types.

A. Animal Carcasses

The Landfill accepts small animal carcasses (household pets) and disposes of them as ordinary waste. Large animals (livestock) and slaughterhouse wastes are not accepted.

B. Water and Wastewater Treatment Sludge

All sludge must be analyzed and approved prior to disposal. Sludge is deposited using a bulldozer or compactor across the refuse on the working face and covered as ordinary refuse. The criteria for sludge acceptance may be found in Appendix F of SPSA’s Unauthorized Waste Control Plan (Module II A-1). A maximum ratio of one ton of sludge per five tons of MSW is acceptable.

C. Tires

Whole tires are taken to the tire shredding facility at the landfill. After being shredded, they are transported to the Refuse Derived Fuel plant and burned as fuel or hauled to the landfill to be used as alternative daily cover or disposed of in the landfill. The Tire Shredder operates under PBR # 072.

D. Drums and Pesticide Containers

In accordance with 9 VAC 20-80-680, drums and other bulk containers are not accepted for disposal at the Landfill until emptied, properly cleaned, opened at both ends, and crushed. Pesticide containers must be triple rinsed before disposal.

E. White Goods

SPSA accepts white goods which contain Freon from residents, businesses and municipalities at a per unit fee. These appliances are then properly evacuated and salvaged or disposed of within 60 days of receipt. No white goods containing Freon are disposed of in the landfill. Appliances delivered to the landfill with labels indicating that the Freon has been removed by a license technician are not subject to the per unit fee.

F. Industrial Waste

Industrial waste requires prior approval from the DEQ-Waste Division or from SPSA's Environmental Program Manager before it may be disposed of at the landfill. The criteria for acceptance of industrial waste are further described in Appendix F of SPSA’s Unauthorized Waste Control Plan (Module II A-1).

G. Incinerator and Air Pollution Control Residues

Residues from incinerator and air pollution control equipment are covered with MSW and/or daily cover as soon as practical to prevent the development of fugitive dusts. If necessary, these wastes are wet down with water from a water truck to prevent dust accumulation.

H. Asbestos Containing Materials

SPSA does not accept materials containing friable asbestos for disposal at the Landfill. Materials containing small quantities of non-friable asbestos may be accepted on a case-by-case basis with prior screening and approval from SPSA’s Environmental Programs Manager.

I. Unshredded Medical Waste

SPSA has received permission from VDEQ to accept unshredded medical waste at the Landfill. This waste has been previously treated in accordance with Virginia's Regulated Medical Waste Management Regulations (9 VAC 20-120 et al) and has therefore been rendered innocuous. However, SPSA's permit amendment allows for disposal of the treated medical waste without being shredded. The Landfill will only accept treated, unshredded medical waste from permitted facilities that have received a variance from VDEQ to the shredding requirements of the medical waste regulations. Described below are the procedures used to dispose of the medical waste.

Prior to leaving the medical waste treatment facility, the hauler must notify Regional Landfill personnel of being en route with an unshredded medical waste load. This provides ample time for SPSA's Landfill personnel to excavate a trench suitable to receive the load. Heavy equipment is used to excavate a trench in the waste of active working face area. An excavator, track loader, track dozer, or compactor is used to excavate the trench. The excavated trench is at least 1.5 times the size of the container's length, depth, and width (i.e., trench will hold 1.5 times the volume of the container).

The container load is deposited directly into the trench by the hauler. Any material that does not fall directly into the trench is immediately pushed into the trench by a track dozer or compactor. A Landfill employee spots the vehicle driver and assists with backing and unloading directions. When the container is emptied, the spotter directs the driver to pull forward and leave the facility.

As soon as the driver pulls the vehicle away from the trench, a track dozer or compactor covers the material with the waste that was excavated from the trench. The trench is immediately covered with 1 foot of compacted soil, an alternate daily cover or 2 feet of solid waste. The entire trench area is covered so there is no visible trace of the non-shredded, treated medical waste.

4.2.10 Bird Hazard Reduction

The working face is kept as small as practicable to reduce the bird hazard to aircraft in the vicinity of the Landfill. In addition, the waste is quickly compacted and covered after it is deposited, to reduce its availability as food for birds.

4.2.11 Entrance Procedures

All vehicles must stop at the scalehouse located at the entrance to the site. Users are charged a per-ton rate or a flat fee for various vehicle types (private automobiles and low-sided pick-up trucks are not charged for the disposal of household solid waste). Upon arrival at the scalehouse, the scale attendant determines the load characteristics and its acceptability to be landfilled. If the load is determined to be unacceptable, it is rejected and directed to an alternate disposal point, or notification is given to the proper authorities for handling of illegal or hazardous loads. If deemed necessary, one of SPSA's Environmental Specialists is called to inspect the load and recommend proper action. The load is rejected if a determination about its containing prohibited waste cannot be made.

After the weighing process, incoming vehicles proceed to the Landfill working face of the fill area via an asphalt and gravel haul road for unloading. Landfill personnel queue vehicles to the fill area and instruct them when to deposit their loads. After unloading, the vehicles are directed back to the haul road, and exit the site onto Route 58. Vehicles not previously weighted empty are directed through the out-bound scales to determine the vehicle weight.

4.3 EQUIPMENT REQUIREMENTS

Various types of mobile equipment are required to operate the Landfill. The quantities and types of equipment necessary are listed in Table 3.

Table 3
Typical Major Landfill Equipment & Personnel Needs by Daily Tonnage

	Equipment			Staff	
Daily Tonnage Range(tpd)	Equipment Type	Description of Use	Minimum Operating Units	Personnel Required	Minimum per Shift
500-2,500	Water Truck	Water for operations	1	Scale Operator	2
	Bull Dozer	Spread waste & cover; Compact; berm construction	2	Equipment Operator	2-8
	Compactor	Compact waste & cover	2-3	Maintenance Workers	2
	Off-Road Truck	Haul cover material	2-3	Landfill Superintendent and Supervisors	3
	Excavator	Soil excavation	1-2	Solid Waste Assistants	5
2,500-5,000	Water Truck	Water for operations	1-2	Scale Operator	2
	Bull Dozer	Spread waste & cover; Compact; berm construction	3-4	Equipment Operator	2-12

	Equipment			Staff	
Daily Tonnage Range(tpd)	Equipment Type	Description of Use	Minimum Operating Units	Personnel Required	Minimum per Shift
	Compactor	Compact waste & cover	3-4	Maintenance Workers	2
	Off-Road Truck	Haul refuse & cover	3-4	Landfill Superintendent and Supervisors	3
	Excavator	Soil excavation	2-3	Solid Waste Assistants	7
5,000-7,500 (Contingency Range[1])	Water Truck	Water for operations	2-3	Scale Operator	2-3
	Bull Dozer	Spread waste & cover; Compact; berm construction	4-5	Equipment Operator	2-14
	Compactor	Compact waste & cover	4-5	Maintenance Workers	3
	Off-Road Truck	Haul refuse & cover	4-5	Landfill Superintendent and Supervisors	4
	Excavator	Soil excavation	2-3	Solid Waste Assistants	9

[1] Contingency range is provided when circumstances at SPSA's Refuse Derived Fuel Plant or Waste-to-Energy Plant require waste diversion to the Landfill. Equipment and personnel requirements will be adjusted accordingly based on quantity and/or duration of waste diversion.

Transfer vehicles are road tractors and non-compacted type semi-trailers equipped for open-top loading. The refuse ejection system may be of the push-blade or walking-floor type. The maintenance requirements, payload capacities, and unloading characteristics are the primary factors utilized in the selection of transfer trailers.

Back up equipment for transfer vehicles is available within SPSA's fleet of transfer vehicles. Back-up equipment for landfilling equipment (compactors, excavator, and bulldozers) is available on site. Replacement equipment for loaders, seeders, and tractors is available at other SPSA facilities. In case of equipment breakdown, SPSA's Equipment Superintendent should be contacted at (757) 398-3058.

4.4 RECORDS

SPSA maintains detailed records of all activities relating to the Landfill. Records are kept either on-site or at SPSA's Operations Office or Regional Office Building and include:

- Types and quantities of waste received.
- Source of waste received.
- Revenue generated from waste received.
- Applications for industrial waste disposal and related analyses.
- Well water usage and leachate disposal quantities.
- Leachate and groundwater monitoring results.
- Landfill gas monitoring results.
- Correspondence from regulatory agencies.
- Accident reports.
- Reports of site and random load inspections.

Table 4 provides a summary of the records maintained for the Landfill.

Table 4
Regional Landfill Record Keeping Requirements

Type of Record	Frequency of Completion	Location Maintained
Waste quantities, waste sources, and revenue received.	Daily	Landfill/Regional Office/ Operations Office
Industrial waste applications and analyses.	Before initial waste disposal and annually thereafter	Environmental Supervisor's Office at the Suffolk Transfer Station
Well water usage and leachate disposal.	Daily	Landfill/Regional Office
Leachate, groundwater monitoring data, and gas monitoring data.	Monthly for leachate, quarterly for groundwater, and quarterly for gas monitoring.	Regional Office
Related correspondence.	Not applicable	Regional Office/ Operations Office
Accident reports.	After each occurrence	Safety office
Site inspections, random waste load inspections.	Daily, quarterly, and annually	Environmental Supervisor's Office at the Suffolk Transfer Station
Reports of random waste inspections.	After each inspection	Environmental Supervisor's Office at the Suffolk Transfer Station

4.5 COMPACTION AND COVER

4.5.1 Compaction

Refuse is evenly deposited on the Landfill working face and subsequently compacted utilizing landfill compactor equipment in layers that do not exceed 2 feet in depth. These layers are applied to construct a lift that does not exceed 10 feet in depth after compaction. A 3:1 (horizontal to vertical) slope is maintained for each cell.

4.5.2 Cover

A. Daily Cover

VSWMR requires Landfill operators to cover exposed wastes at the end of each day to control disease vectors, fires, odors, blowing debris, and scavenging. Cover material is to consist of 6 inches of compacted soil, or an alternative material that has been approved by VDEQ. Daily cover is applied at the Landfill at the end of each operating day. A minimum of three days of acceptable cover soil is maintained on-site at all times. Sources of soil for daily cover include excavation from Cell VII and the Soilex Soil Treatment Facility located on-site.

- Cell VII Excavation

  Soil excavated for the construction of the Cell VII expansion of the Landfill will be used as daily cover, intermediate cover, and for closure of cells as available. . Excess soil is stored on-site and hauled to the working face as needed for daily and intermediate cover. It will also be used in the construction of Cell VII.

- Soilex Soil Remediation and Treatment Facility

  August 1999 marked the launching of the SPSA/Soilex partnership. Soilex is a private contractor that specializes in treating petroleum-contaminated soil. Soilex has a soil treatment facility at the landfill located adjacent to the Tire Processing and Ferrous Metals Processing Facilities. A brief summary of the operations of the Soilex facility is provided below. A more detailed summary can be found in Appendix C of this manual.

  Soilex accepts soils and other non-hazardous solids that are contaminated with petroleum products such as gasoline, diesel fuel, and heating oil. Soilex's customers include major oil companies, industrial and manufacturing facilities, and homeowners who have petroleum spills.

  Soilex requires its customers to demonstrate that materials are non-hazardous and contaminated only by petroleum products. This demonstration is made by laboratory analysis of the materials. Once accepted, Soilex treats the contaminated materials in accordance to the procedures outlined in Appendix C. Once laboratory analysis confirms that the treated material meets the regulatory requirements for clean soil as defined by VSWMR, it is used for multiple landfill operational purposes. These include daily and intermediate cover, road construction, etc. Soils with total BTEX less than 10 ppm and less than 100 ppm TPH are used or disposed within the landfill.

Soilex has the responsibility of ensuring that all treated materials that are provided to the Landfill for disposal or operational use are non-hazardous and within acceptable limits for BTEX, TOX, and TPH. SPSA reserves the right to review reports of laboratory analysis to verify the characteristics of accepted materials. Additionally, SPSA may periodically collect random samples of the treated soil to ensure it meets regulatory criteria for clean soil.

The Soilex facility has an annual design capacity of 40,000 tons and is capable of processing 300 tons per day (tpd).

B. Alternate Daily Covers

In addition to the use of soil cover, VDEQ has granted SPSA permission to utilize alternative daily cover (ADC) systems at the Landfill. These include the use of coal-fired ash, tire shred, waterway fines, non-hazardous MSW incinerator ash, and the Posi-Shell Cover System. The use of any ADC will cease if it proves to be ineffective in achieving any purpose of daily cover as set forth in VSWMR. In that event, SPSA will resume the use of soil as daily cover at the Landfill. A description of the above ADC systems is provided below.

1. Coal-Fired Ash

a. Coal-fired ash is another material that is used as ADC at the Regional Landfill. Generators of coal-fired ash must demonstrate the material is suitable for use as ADC. (SPSA reserves the right to determine the suitability of any material for use as ADC.) They must complete an application and screening process to ensure the coal-fired ash is not hazardous and its moisture content is not too high.

b. Approved generators deliver the coal-fired ash to the landfill. It is stockpiled near the active working face and applied in three-inch layers over compacted solid waste. The coal fired ash is then overlain with three to four inches of soil. The total thickness of the ADC is ***at least six inches*** when compacted. The ash to soil ratio in the ADC is never greater than 1:1. The soil/ash combination is not used for intermediate or final cover.

c. Coal-fired ash is effective in controlling disease vectors, odor and blowing debris. During periods of heavy precipitation, coal-fired ash is not used as ADC, but instead it is mixed and disposed of with MSW. Coal-fired ash is stockpiled no longer than ***5 calendar days*** before it is used as ADC or disposed of at the landfill.

2. **Tire Shred**

a. SPSA vehicles haul tire shred from the onsite Tire Processing Facility to the landfill working face, where it is stockpiled for use as ADC. The size of the tire shred does not exceed 4"X10" in any dimension.

b. Tire shred is applied in three-inch layers over compacted solid waste. The tire shred is then overlaid with three to four inches of soil. The total thickness of the ADC is ***at least six inches*** when compacted. The tire shred to soil ratio in the ADC is never greater than 1:1.

c. The soil/tire shred combination is not used for intermediate or final cover. Tire shred is stockpiled no longer than ***5 calendar days*** before it is used as ADC or disposed of at the landfill.

3. **Waterway Fines**

a. Waterway's recycling facility is located at the Waterway Marine Terminal on Precon Road in Chesapeake, Virginia. The first part of Waterway's process is size reduction of the incoming CDD waste streams. During this stage, the CDD is ground up and sent to a star screen where soil, mulch-like wood bits, tiny pieces of tar-paper/asphalt shingles and other pebble-size inert particles are separated from the bulkier waste.

b. This separated waste stream is what has been designated as the "fines material", and is estimated to consist of 95% soil. As such, this material is suitable for use as an ADC at a sanitary landfill, however, its use is restricted to the interior slopes of the landfill.

4. **MSW Incinerator Ash**

a. Six inches of ash are applied over compacted solid waste on the Landfill working face.

b. SPSA's ash trailers deliver the MSW ash to the Landfill continuously throughout the day. It is unloaded near the working face and periodically spread over layers of solid waste using a landfill compactor.

c. There are two intrinsic characteristics of the MSW ash that affect its ability to be used as part of the ADC system. At times, the ash is extremely dry when it is unloaded at the Landfill. This creates dusty conditions that cause visibility and inhalation problems. To minimize this problem, dry ash is wet down using the water truck that is housed at the Landfill. Other times, the ash may be very slick upon delivery, which causes traction difficulties for vehicles entering and exiting the Landfill working face. Therefore, slick ash is not used as part of the ADC system. Instead, it is immediately mixed with incoming MSW, and then covered with either more MSW, soil, or other approved ADC material.

d. Extremely wet weather conditions have the greatest impact on using ADC. Periods of high precipitation cause the ash to be slick, which creates the traction problems previously mentioned. To accommodate this problem, peanut hulls are applied to the roadbeds leading to the working face. During strong rainfall events, ash is not used as ADC, but is instead mixed with MSW and covered as previously described.

e. SPSA routinely characterizes the MSW ash used as ADC to ensure it does not possess any hazardous characteristics. SPSA's Ash Characterization Plan calls for the quarterly analysis of Power Plant ash for TCLP metals. The results of these analyses are statistically evaluated to determine if the ash passes United States Environmental Protection Agency's (USEPA) Toxicity Characteristic. If any hazardous characteristics are confirmed to be present in SPSA's ash, it is deemed to be a hazardous waste and is handled and disposed in accordance with applicable regulatory requirements.

f. Records and reports concerning the use of SPSA's ADC system are maintained at SPSA's Regional Office Building in Chesapeake, and will be kept throughout active, closure, and post-closure periods of the facility.

g. Restrictions on use of MSW ADC:

- MSW ash is not used as ADC within **<u>50 feet</u>** of the outer side slopes of the Landfill.
- MSW ash does not remain exposed for more than **<u>14 days</u>**.
- MSW ash is **<u>not</u>** used as intermediate cover.

5. Posi-Shell Cover System

a. Posi-Shell is a spray applied, cement-like alternative cover that forms a durable, non-flammable crust. It is capable of resisting wind and water erosion for many months after initial application. Posi-Shell is an environmentally compatible combination of Cementitious Mineral Binder (approximately 6-7 tons), and Liquid and Posi-Pak® with Fibers (4 to 5 30-lb. bundles). "Liquid" is defined as being 100 percent non-potable water or leachate, or a 90 percent non-potable water and 10 percent latex paint combination. Posi-Paks contain a mixture of materials including recycled plastic and cellulose fibers. The Posi-Shell is certified non-flammable, non-fuel contributing and non-smoke producing in accordance with ASTM E-1354.

b. The Posi-Shell applicator is a self-contained, trailer-mounted cement slurry mixer sprayer unit. The PSA 2000 unit is capable of mixing 2,000-gallon loads in a mixing time of 10 minutes. The units are equipped with a tow bar capable of being towed by mobile track equipment. The application unit does not require any auxiliary power source. It is capable of one-person operation during mixing, spraying, and clean-out sequences. The system is capable of use during freezing weather conditions.

c. Posi-Shell is used as daily cover at the Landfill and for erosion control of the intra-gradient slopes of the Landfill if necessary. Six inches of compacted soil is applied weekly in all areas where Posi-Shell has been applied as daily cover.

6. Non-Hazardous Contaminated Soil

a. Six inches of soil are applied over compacted solid waste on the landfill working face.

b. Contaminated soil is delivered to the landfill with prior approval only. As the material is delivered throughout the work day, it is unloaded near the working face and periodically spread over layers of solid waste using a dozer or landfill compactor.

c. Contaminated soil may require special actions be taken to improve performance as alternative daily cover. Soils received at the landfill which are extremely dry can create dusty conditions that cause visibility and inhalation problems. To minimize this problem, dry soil is wet down using the water truck that is housed at the landfill. Other projects may produce soil which passes a paint filter test yet is wet and difficult to spread. These wet materials may be stockpiled on an inward gradient portion of the lined landfill until such time that the material is dry enough for use as ADC.

d. SPSA will require the generators of contaminated soil to completely characterize the material prior to acceptance to ensure it does not possess any hazardous characteristics. Limitations detailed in SPSA's Special/Industrial Waste Acceptance Criteria (Appendix F of SPSA's Unauthorized Waste Control Plan) will be utilized to determine acceptability of contaminated soils. Each request to use contaminated soil as ADC will undergo a thorough review of the contaminants of concern as well as the manner in which the material was generated. This information will be used to determine the type and frequency of analyses to be performed. If any hazardous characteristics are confirmed to be present, SPSA will deny the request for use as ADC.

e. Records and reports concerning the use of SPSA's ADC system are maintained at SPSA's Regional Office Building in Chesapeake, and will be kept throughout active, closure and post-closure periods of the facility.

f. Restrictions on use of Contaminated Soil ADC

- Contaminated Soil is not used as ADC within **<u>50 feet</u>** of the outer side slopes of the landfill.
- Contaminated Soil does not remain exposed for more than **<u>14 days</u>**.
- Contaminated Soil is **<u>not</u>** used as intermediate cover.

C. Intermediate Cover

Intermediate cover of at least 12 inches (6 inches of daily + 6 inches more) will be applied whenever an additional lift of refuse is not to be applied within 30 days. All areas with intermediate cover exposed are inspected on a weekly and an as needed basis. Additional cover material is placed on all cracked, eroded, and uneven areas as required to maintain the integrity of the intermediate cover system. MSW ash and Posi-Shell are ***not*** used for intermediate cover at the Landfill.

D. Final Cover

A final cover system as described in § 4.2 of the Closure Plan will be applied whenever any of the following conditions exist:

- Within 30 days after the date on which the unit receives the known final receipt of waste; or
- The Landfill's permit is terminated for any reason and within 90 days of such termination.

E. Vegetative Cover

Vegetative cover will be established and maintained in accordance with the procedures described in § 4.2 of the Closure Plan.

4.5.3 Stockpiles

As required by VSWMR, three days of cover material is maintained at the Landfill. Given the current and anticipated daily refuse volume for the landfill of approximately 5,844 cubic yards (CY), three days of cover material can be satisfied with a stockpile of 3,506 CY (in place). The location of the stockpile is within 1,000 feet of the active disposal area. Calculations for stockpile sizing may be found in Attachment A-2 of Permit Module III.

SECTION 5.0
SAFETY PLAN

5.1 PURPOSE

SPSA's Safety Department has developed a comprehensive Handbook of Safety Policy Directives to ensure safe operations of all SPSA facilities. This section highlights safety guidelines and procedures to be followed to ensure a safe working environment for employees and users of the Landfill.

5.2 SAFETY PROCEDURES

A. General Safety Procedures

1. Employees are properly trained and informed of all safety procedures prior to assignment of job responsibilities.
2. Landfill supervisors periodically review the operation of machinery and equipment to assure that safety rules and guidelines are being followed.
3. Pre-start checks are performed by equipment operators to assure that the equipment is always safe and in proper operating condition.
4. All mobile equipment and vehicles operated on the premises must be driven under the maximum safe speed, not exceeding 25 mph. Speed limits are posted where applicable.
5. Site user rules are posted at the entrance to the site.
6. Landfill employees must be constantly alert for potential hazards and be informed of SPSA's Hazard Communication Program, established in compliance with OSHA standard 1910.1200.
7. Landfill employees must be constantly alert for the possibility of fire or explosion.
8. Fire extinguishers are provided in all buildings and on all heavy equipment.
9. Safety meetings are held regularly to discuss the causes of accidents that have occurred and ways to prevent the occurrence of similar incidents in the future.
10. Hard hats must be worn at all times and safety belts must be worn while operating equipment.

B. Additional Safety Procedures

1. The Landfill Supervisor has the primary duty of constant supervision of unloading, spreading, and compacting of MSW and daily cover, and is present at all times when placement or covering operations are ongoing.

2. Short-range, two-way radios have been provided to all supervisors, traffic spotters, and compactor operators for the purposes of issuing instructions and emergency communication at the Landfill working face. In addition, another radio is on-site for communicating with the Administrative Office and the Scalehouse.
3. A plan for alternating vehicle unloading, waste spreading, and compacting in a specific area has been devised so that compactors, unloading vehicles, and spotters are not in close proximity.

5.3 WORKING FACE HAZARD CONTROL

A. Traffic spotters control, limit, and direct vehicle unloading, keeping mechanically unloading vehicles separated from manual unloading vehicles in order to avoid interference, facilitate smooth traffic flow, and minimize delay.

B. Spotters must remain out of the path of any moving vehicle and be constantly aware of all vehicles maneuvering on the working face of the fill area.

C. All employees are required to wear safety shoes, hard hats, goggles, and reflective vests, and are not permitted to work should they fail to do so.

D. Smoking is strictly prohibited on the working face of the fill area.

E. Supervisors monitor dust levels at the Landfill. If dust levels begin to become a health hazard, supervisors instruct employees to wear the appropriate breathing apparatus. Wastes with the potential to cause dust are wet down using a water truck before disposal.

5.4 VEHICLE UNLOADING PROCEDURES

A. Unloading operations do not begin until the Landfill supervisor or designated representative has determined the vehicle is in position and ready to unload.

B. Landfill supervisors or their designees must signal the vehicle operators to begin unloading their waste loads. Extreme care must be exercised to ensure that the trailer is in place with tops open and that unacceptable waste is not present prior to unloading.

C. No person may move or unload waste without the assistance of landfill personnel.

D. After unloading, Landfill personnel direct vehicles to exit the working face of the active disposal area.

5.5 EMPLOYEE SAFETY TRAINING

A. General

Personnel training in job responsibilities, and operations, safety standards, and potential hazards associated with the facility are important elements in achieving a safe workplace. Supervisors are responsible for assuring that all new employees received adequate training to prepare them for performing their assigned responsibilities in a safe and productive manner.

B. Defensive Driving Courses

A defensive driving course is presented to all personnel who operate vehicles owned or furnished by SPSA.

C. On-the-Job Training

Landfill supervisors provide on-the-job training for all Landfill employees. This training includes, but is not limited to:

- SPSA Safety Program familiarization.
- Prescribed safety clothing and equipment for the job and how to use it.
- Emergency treatment of injuries.
- Proper procedures for reporting a fire, serious injury, or accident.
- Potential hazards associated with the job.
- Safety policies.
- Disciplinary procedures.

D. Supplemental Safety Activities

SPSA's Safety Department provides supplemental safety training and enforcement of safety activities. This may include safety film and/or slide presentations, promotional literature such as safety posters, bulletins, pamphlets, and other related media.

5.6 PERSONAL PROTECTIVE EQUIPMENT

All SPSA employees are supplied with appropriate personal equipment at SPSA's expense. The required protective equipment is posted in each work area. Employees failing to wear the posted protective equipment are subject to disciplinary action. SPSA provides each employee with the personal protective equipment required for the safe performance of his or her duties. This equipment may include:

- Head protection ⇒ hard hat.
- Hearing protection ⇒ ear plugs or ear muffs.
- Eye and face protection ⇒ safety glasses, goggles, and/or face shields.
- Respiratory protection ⇒ disposable dust mask or respirator.
- Body protection ⇒ SPSA uniform of appropriate material.
- Hand protection ⇒ work gloves of appropriate material.

- Foot protection ⇒ steel-toed work boots.

5.7 SAFETY MANUAL

SPSA's Safety Department published a ***Handbook of Safety Policy Directives*** that compiles all of SPSA's safety requirements into one document and includes the Safety Manual as the first directive. Employees are responsible for knowing where the Handbook is located and for any training they receive on safety programs related to their job duties. Supervisors are responsible for providing this information to their employees. SPSA's New-Hire Orientation includes a safety segment that highlights the essentials for ensuring that all work tasks are performed in a safe manner and safe environments are maintained at every SPSA location.

5.8 FIRE CONTROL PLAN

The Emergency Plan for the Landfill contains the Fire Control Plan for the facility. The Emergency Plan may be found Section 9.0 of this Operations Manual.

5.9 COMMUNICATIONS SYSTEM

Communication between the Landfill working face and the Administration Building and vehicles occurs via C-B and two-way radios.

SECTION 6.0
CONTROL AND MONITORING OF LIQUIDS AND GASES

6.1 COLLECTION, MONITORING, AND TREATMENT OF LEACHATE

6.1.1 Leachate Collection System

Collection and removal of leachate generated from waste within the Landfill is accomplished by a system of perforated PVC and/or HDPE pipe installed within gravel-filled trenches beneath a sand drainage layer atop the liner system. The perforated pipes and trenches direct leachate by gravity to sumps within the cells. The sumps within Cells I-IV gravity drain to manholes along the east and west sides of the landfill, which subsequently drain to the leachate lagoons on-site. Cells V and VI each have four sumps with submersible-type leachate pumps. Cell VII will have five sumps with submersible type leachate pumps. These pumps transfer leachate via HDPE piping (force main) to a proposed pump station that will be located near the southeast corner of Cells I-IV. The leachate is then pumped to the on-site aeration pond or proposed leachate storage tank before it is pumped via force main to the municipal wastewater treatment facility (HRSD).

6.1.2 Maintenance of Leachate Collection System

Debris is cleared from the leachate collection pipes to ensure free flow of leachate. The pipes are accessed by the manholes and cleanouts. If pipes fracture, leachate will flow through the granular trench backfill material. A continuous granular blanket or geonet drainage composite allows drainage of leachate even in the event of total failure of the leachate collection lines.

6.1.3 Leachate Monitoring and Record-keeping

SPSA’s Industrial Wastewater Discharge Permit requires routine leachate analysis and maintenance of accurate records of leachate disposal quantities. Monthly and semi-annual sampling is performed. SPSA submits the results of all sampling events to HRSD and also maintains copies on file at SPSA’s Regional Office Building. A copy of SPSA's Industrial Waste Discharge Permit may be found in Appendix D.

A. Monthly Monitoring

Each month a leachate sample is collected and analyzed for parameters required by SPSA's HRSD Permit. Table 5, lists these parameters, with the effluent limitations established by the discharge permit. The methods of analysis are also provided.

In addition, SPSA maintains records of the amount of leachate discharged to HRSD each month. The leachate meter is read daily and the results are recorded on the Leachate Disposal Quantities form. SPSA submits monthly discharge quantities to HRSD as required by the permit.

B. Semi-Annual Monitoring

Semi-annually, a leachate sample is collected and analyzed for its content of toxic organics (TTO). The analysis methods used are USEPA Methods 624 and 625, and the effluent limitation for TTO is 2.13 mg/l with no single parameter exceeding 1.0 mg/l.

C. Quality Assurance Quality/Control

To ensure the validity of results of analyses of leachate samples, SPSA required its independent laboratory to develop and implement a strict Quality Assurance/Quality Control (QA/QC) Program. The QA/QC must at minimum consist of the following:

1. Proper Sampling and Preservation Techniques

   Qualified personnel collect all samples, using all quality assurance procedures in EPA Document SW-846. Table 6 provides a summary of the sample containers; preservation technique and holding times are used.

2. Chain-of-Custody Program

   A Chain-of-Custody program will be used to provide tracking of individual samples from the time of the field sampling event through laboratory analysis. This program will consist of sample labels, sample seals, field log book, and Chain-of-Custody record.

   a. Sample Labels

      Each sample container is to be pre-printed with a durable label that includes the following information:

      1. Sample number.
      2. Date and time of collection.
      3. Location.
      4. Name of collector.
      5. Parameters to be analyzed.

   b. Sample Seal

      Seals are placed on individual containers or the entire package to ensure that samples are not disturbed during transport to the laboratory. Samples that arrive to the laboratory with the seal broken are considered invalid unless it can be demonstrated that its integrity has been maintained.

   c. Field Log Book

      All observations and field activities are to be recorded in a dedicated log book.

d. Chain-of-Custody

Each sample is to be documented on a Chain-of-Custody form. The following information is to be recorded:

1. Project number.
2. Project name.
3. Sampler's signature.
4. Sampling location, date and time of sample collection, sample designation and a brief description of the sample type.
5. Total number of sample containers.
6. All transfers of the container.

3. Use of Proven and Acceptable Analytical Methods

All wastewater analyses are conducted in accordance with appropriate procedures contained in 40 CFR Part 136.

4. Statistical Evaluation of Data

The final aspect of the QA/QC program involves statistical evaluation of the analytical data to ensure its accuracy. SPSA's independent laboratory employs a statistician who performs these calculations to validate the data. The results from the procedures are maintained on file at the laboratory, and made available upon SPSA's request.

Table 5
Leachate Monitoring Parameters

Parameters	Test Method	Effluent Limitation
pH	EPA 150.1	>5.0
Phenols	EPA 9065	2.0 mg/l
BOD*	Standard 5210B	NA
Cadmium	EPA 3010/6010	0.1 mg/l
Copper	EPA 3010/6010	5.0 mg/l
Chromium	EPA 3010/6010	5.0 mg/l
Lead	EPA 3010/6010	2.0 mg/l
Mercury	EPA 7470	0.02 mg/l
Nickel	EPA 3010/6010	2.0 mg/l
Zinc	EPA 3010/6010	5.0 mg/l

Table 6

Leachate Sample Collection & Preservation Techniques

Parameter	Sample Volume	Container Type	Preservation	Holding Time
BOD	1,000	P/G	Cool 4° C	48 hours
pH	50	P/G	None required	Analyze Immediately
Phenols	1,000	G only	Cool 4°C, HNO3 to pH <2	28 days
TKN	500	P/G	Cool 4°C, H2SO4 to pH <2	28 days
Total Phosphate	50	P/G	Cool 4°C	28 days
Volatile Organics (method 624)	40	G, teflon lined cap	Cool 4°C	14 days
Semi-Volatile Organics (method 625)	1,000	G, Teflon lined cap	Cool 4°C, 0.008% Na2 S2O3	40 days after extraction
Metals (all except Cr and Hg)	500	P/G	HNO^3 to pH <2	6 months
Chromium	200	P/G	Cool 4°C	24 hours
Mercury	100	P/G	HNO^3 to pH <2	6 months

6.2 LANDFILL GAS MONITORING AND CONTROL

In accordance with the Landfill Gas Management Plan located in Permit Attachment II-2 of the Cell VII Part B Permit Application, decomposition gases are monitored on a routine basis to ensure their levels do not pose a threat to human health or the environment. SPSA has implemented gas monitoring for the active life of the Landfill that will be continued throughout the closure and post-closure care periods.

The decomposition gas concentration is routinely monitored to ensure that the following requirements are met:

- The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit (LEL) for methane in facility structures (1.25 percent methane).
- The concentration of methane gas migrating from the Landfill does not exceed 100 percent of the LEL for methane at the facility property boundary (5 percent methane).

Remedial efforts must begin if the methane concentrations at the Landfill Facility Boundary reach 80 percent of the LEL methane (or 4% methane by volume) or if the methane concentrations in the Landfill Facility structures or offsite structures reach the regulatory limit for structures (1.25% methane by volume).

6.2.1 Cells I-IV

Monitoring of gases within Cells I-IV is accomplished through a total of 20 permanent multiple depth gas probes, which have been strategically placed along the perimeter as shown in Figure 3. The construction detail of the probes can be found in the Permit Module III.

6.2.2 Cell V-VI

Twelve additional probes are part of the monitoring network to monitor gas migration around Cell V and VI. Two of these probes will be abandoned upon construction of Cell VII. Figure 3 shows the locations of the remaining gas probes around Cells V and VI and VII upon construction of Cell VII.

6.2.3 Cell VII

Ten additional probes will be installed to monitor gas migration around Cell VII. Figure 3, Perimeter Gas Probe Locations, shows the proposed locations of these probes.

6.2.4 Monitoring

The gas probes are monitored using a Combustible Gas Indicator that can determine %LEL, oxygen (O_2), and methane (CH_4) concentrations. Water table levels are also measured during each monitoring event. In addition, gas concentrations are also monitored in the various enclosed structures located on the site.

6.2.5 Monitoring Frequency

SPSA monitors landfill gas concentration and migration on a quarterly basis. If gas migration is detected, a monthly monitoring program will be initiated. In addition, SPSA will develop and implement a remediation plan to correct the gas problem. Results from gas monitoring are reported to VDEQ on the form provided in Appendix B. The form will be updated upon completing the installation of gas probes for Cell VII.

6.2.6 Landfill Gas Control

In the event that gas monitoring results indicate the concentrations of methane are in excess of applicable compliance levels, the following actions are taken.

A. All immediate steps necessary to protect public health and safety are taken as required by the Emergency Plan for the Landfill.

B. The VDEQ-TRO is notified within five working days of notification that the compliance levels have been exceeded and the steps taken to correct the problem.

C. Within 60 days of detection, a Remediation Plan for methane gas releases will be developed and submitted to the director. The Plan will describe the nature and extent of the gas problem and the proposed remedy.

D. A gas control system will be designed and constructed within a period of time specified in the approved plan. The gas control system will be installed in accordance with a design and manner approved for construction by the Director.

E. The gas control system will be designed to:

   1. Prevent methane accumulation in on-site structures.
   2. Reduce methane concentrations at monitored property boundaries to below compliance levels.
   3. Provide for the collection and treatment and/or disposal of condensate produced by any gas control system.

LEGEND

W-57 ⌖ EXISTING GAS WELL

GP-9 ◐ EXISTING PERIMETER GAS PROBE

GP-19 ☒ EXISTING PERIMETER GAS PROBE (TO BE REMOVED)

GP-54 ⌖ PROPOSED PERIMETER GAS PROBE

——— EXISTING HDPE HEADER (SIZE VARIES)

- - - - EXISTING HDPE LATERAL (SIZE VARIES)

NOTES

1. EXISTING TOPOGRAPHY SUPPLIED BY HURT AND PROFFIT, INC. FROM AERIAL PHOTOGRAPHY DATED ______________.
2. THE BUFFERS OUTLINED IN 9VAC 20-80-250 A(7) WILL BE MAINTAINED.
3. THE CONDITIONS SHOWN AS EXISTING ON THIS DRAWING REPRESENT GENERAL CONDITIONS AT THE TIME OF THE AERIAL PHOTOGRAPH DATED ______________.

HDR

HDR Engineering, Inc.
of the Carolinas

128 S Tryon Street, Suite 1400 | Charlotte, NC 28202

ISSUE	DATE	DESCRIPTION
A		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
DESIGNED	D.T. DECESARE, P.E.
DESIGNED	G.M. WILLIAMS, E.I.
DESIGNED	L. DAIGLE
CHECKED BY	C. LEBRON
DRAWN BY	D. SOSA
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill Proposed Cell VII

Part B Application

SUFFOLK VIRGINIA

PERIMETER GAS PROBE LOCATIONS

0 1" 2"

FILENAME	00C-01.dwg
SCALE	1"=300'

SHEET

FIG 3

C:\PWworking\TPA\d0125691\00C-01.dwg, Plot, 8/27/2008 6:27:37 PM, gwilliam

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6.2.7 Landfill Gas Recovery System

The Landfill Gas (LFG) Recovery System constructed on-site in 1994 represents one of many of SPSA's efforts to find beneficial uses for landfill waste. A collaborative effort between SPSA and the private company U.S. Energy & Biogas Corporation (US Energy), the gas recovery system serves a two-fold purpose: 1) reducing the build-up of methane gas along with its associated hazards and odors, and 2) generating electric power which is sold to a local utility company.

U.S. Energy operates the energy recovery system that consists of a well field in Cells I through V, a landfill gas flare, and power generating station. The flare is operated by SPSA with assistance from a private contractor. Landfill gas is piped to the power plant from the series of wells, after which an electrically powered blower delivers the gas to four engine/generator sets installed in a pre-engineered metal building. The total power generation is limited to 3.575 megawatts, with 3.0 megawatts delivered to Virginia Power and the balance used to operate in plant support equipment. The Power Plant consumes 75 tons of landfill gas per day, or 3.1 tons per hour. It is designed to run 24 hours per day, 365 days per year except for maintenance shutdowns. In the event that a power plant shutdown occurs for more than 24 hours, the gas will be routed to the flare via piping with a manually controlled electric valve.

Gas condensate generated and collected within Cells I-IV will be reintroduced back into Cells I-IV via knock-out pots and/or sumps within the disposal limits. In locations where gas condensate collected within the disposal limits cannot be reintroduced through knock-out pots and/or sumps, the gas condensate will be reintroduced into the leachate collection system.

Gas condensate generated and collected within Cells V-VII will be reintroduced back into Cells V-VII via knock-out pots and/or sumps within the disposal limits. In locations where gas condensate is collected outside the disposal limits it will be reintroduced into Cells V-VII via the leachate collection system, the working face, and/or one of the gas sumps/vertical wells/knock-out pots.

Gas condensate generated and collected at the gas plant will be reintroduced back into Cells V-VII via the leachate collection system, the working face, and/or one of the gas sumps/vertical wells. Once returned into the cells, the gas condensate is collected in the leachate collection system. Leachate and gas condensate collected from all cells is pre-treated at the landfill's lagoons and discharged to the local publicly owned treatment works.

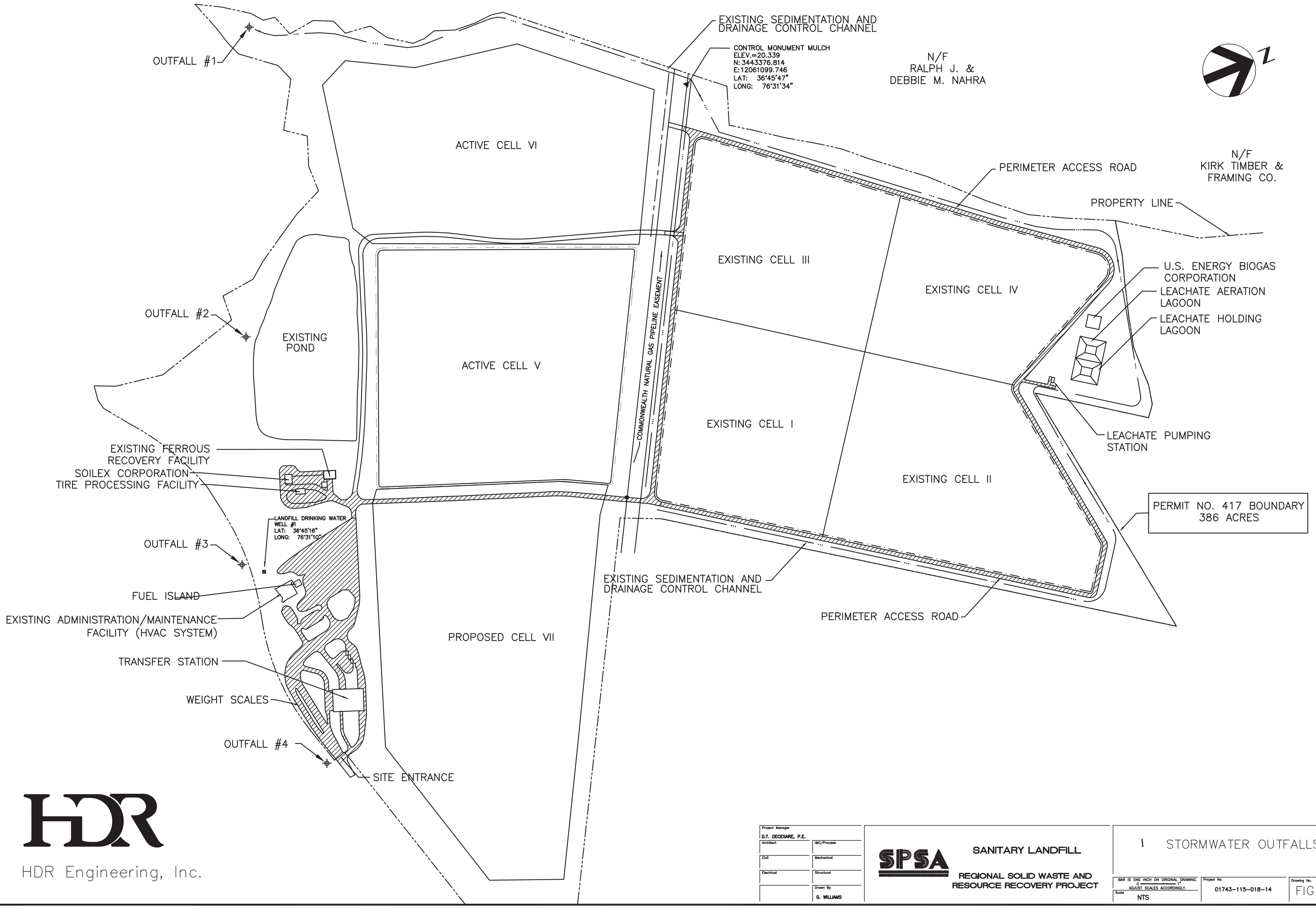
It is anticipated that the gas collection system will be expanded into Cell VII.

6.3 GROUNDWATER AND STORM WATER MONITORING

SPSA has proposed a rigorous groundwater-monitoring plan for the Landfill, including the Cell VII expansion that complies with 9 VAC 20-80-300. It is implemented through the quarterly sampling of 22 wells and analyzing for the parameters in Table 5.5 and annual sampling of Table 5.1 parameters as provided in 9VAC 20-80-300. SPSA's independent consultant has prepared a

Groundwater-Monitoring Plan for the Landfill that outlines the groundwater-monitoring requirements for the facility. The Plan includes information concerning monitoring well locations; specifications and installation; sampling procedures and quality control; and description of the methods of analysis. This report may be found in Permit Module X.

SPSA’s current VPDES permit for the Landfill requires quarterly and semiannual monitoring of the three outfalls on the site. This permit will need to be updated to include one additional outfall. Samples collected from these points are analyzed for the constituents listed in Part IA of the VPDES permit provided in Appendix D. Figure 4, Stormwater Outfalls, shows the locations of the three outfalls.



C:\Documents and Settings\GWilliam\Desktop\FIG 4.DWG, Layout1 (2), 8/27/2008 5:50:48 PM, gwilliam

HDR Engineering, Inc.

Project Manager
D.T. DECESARE, P.E.
Architect
I&C/Process
Civil
Mechanical
Electrical
Structural
Drawn By
G. WILLIAMS

SPSA

SANITARY LANDFILL

REGIONAL SOLID WASTE AND
RESOURCE RECOVERY PROJECT

1 STORMWATER OUTFALLS

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
ADJUST SCALES ACCORDINGLY.
Scale
NTS
Project No.
01743-115-018-14
Drawing No.
FIG 4
Issue
1

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6.4 MAINTENANCE OF DRAINAGE AND EROSION CONTROL SYSTEMS

Periods of heavy rain may cause sediment and debris to accumulate in drainage ditches due to soil erosion. The effects of heavy periods of rain are minimized by the installation of permanent drainage ditches sloped to direct the flow of water to the large drainage channel around the perimeter of the Landfill. The perimeter drainage system is maintained by preventing the accumulation of litter and debris that might restrict the flow of stormwater. Erosion control systems are maintained by adding more cover material, and grading and reseeding as necessary to maintain the integrity of intermediate and final cover systems.

6.5 PROCESS WATER MONITORING (CELL VII DEWATERING SUMPS)

The Process Water Monitoring Plan is provided in Module II A-2 of the Cell VII Part B permit application.

SECTION 7.0
INSPECTION PLAN

Several inspection plans are used to ensure that SPSA continuously operates an environmentally sound and safe Landfill. During the active life of the Landfill, SPSA's Department of Environmental & Safety Management and Landfill personnel perform routine inspections. SPSA randomly inspects incoming waste loads to ensure no unauthorized wastes are disposed of at the Landfill. Independent consultants and SPSA employees will inspect the Landfill during the post-closure care period. The following outline describes the daily, safety, random, and post-closure inspections performed at the Landfill. The checklist for each type of inspection is included in Appendix B.

7.1 DAILY INSPECTIONS

Each day, the Landfill supervisor inspects the Landfill to ensure it is in satisfactory operating condition. Areas evaluated include, but are not limited to:

- Condition of all weather roads;
- Proper functioning of the leachate collection system;
- Condition of drainage ditches;
- Integrity of intermediate and vegetative cover;
- On-site availability of adequate daily cover;
- Proper functioning of all emergency and operation equipment;
- Recording leachate disposal quantities and well water usage; and
- Daily weather forecasts

7.2 SAFETY INSPECTIONS

SPSA's Safety Department conducts safety inspections of all SPSA facilities and provides written reports of deficiencies to SPSA’s Executive Staff. Facility supervisors perform monthly inspections of each facility to ensure that hazards are kept to a minimum and safe working guidelines are being followed. Written reports of these inspections are kept on file at the facility and reviewed by the Safety Department during its annual inspection. All inspections are conducted using the Safety Inspection Guide, which places emphasis on the following:

- General housekeeping.
- Use of prescribed protective equipment by employees.
- Compliance with established safety regulations.
- Proper maintenance of buildings, equipment, and vehicles including:
  - Perimeter fencing.
  - Access gates.
  - On-site roads.
  - Wastewater collection system.

- Stormwater collection system.
- Transfer building integrity.
- Mobile equipment.
- Safety and emergency equipment.

7.3 RANDOM WASTE LOAD INSPECTIONS

SPSA prevents unauthorized wastes from entering its facilities through industrial and solid waste inspection, household hazardous waste collection and hazardous waste generator certification. Procedures to prevent the disposal of unauthorized waste also include random checking of incoming waste loads by SPSA's trained Environmental Specialists at all SPSA facilities.

A. Procedures

Random commercial loads are directed to discharge waste in an area designated for waste screening, where a front-end loader spreads out the waste. Two Solid Waste Inspectors wearing the appropriate personal protective equipment and equipped with rakes look through the waste for regulated hazardous, prohibited and PCB waste. Household hazardous and conditionally-exempt hazardous wastes are not included in this screening process.

B. Waste Management

Waste determined to be unacceptable will be handled according to the following procedures:

- Car batteries, tires, and gas cylinders (freon and propane) are removed and handled according to SPSA's established procedures.
- Industrial wastes (contaminated soil, sandblast, etc.) are rejected and the generator notified of SPSA's Industrial Waste Application process.
- Used oil filters are removed for crushing and recycling.
- Hazardous waste including chemicals, bulk fuels and solvents, etc., and prohibited waste including unknown gas cylinders, liquids, untreated medical waste, asbestos, etc., is removed and stored for disposal via hazardous waste contractor. The waste hauler is billed for the cost of disposal.

C. Records

A Waste Screening Inspection Report is completed for each waste load inspected, with a copy maintained at the facility and one forwarded to the VDEQ if regulated hazardous waste is found. Photographs are taken of hazardous or prohibited waste and kept on file with the inspection report. The waste hauler is also sent a copy of the inspection report and notified of the results. Repeat hazardous waste generators are suspended from utilizing SPSA facilities until the problem is resolved. A copy of the Waste Screening Inspection Report may be found in Appendix B.

D. Training

SPSA continues its training program for all employees involved in receiving and processing solid waste at SPSA facilities. Training is updated annually and includes a review of SPSA's waste policies, PCB waste, and wastes that are hazardous or prohibited. Employees are reminded to remain alert for labels with hazardous warning words or symbols, materials smoking or emitting odors, and questionable drums, boxes or bags. Employees are instructed on safety in the workplace and to notify their supervisor if they spot hazardous or prohibited waste. SPSA's Environmental Specialists are given annual refresher training on hazardous and PCB waste identification, use of PPE, and safe management of hazardous waste.

7.4 ENVIRONMENTAL COMPLIANCE INSPECTIONS

SPSA’s Environmental Compliance Coordinator performs quarterly environmental compliance inspections of all SPSA facilities. During these inspections, facility operations are reviewed to ensure compliance with applicable requirements of the VSWMR. Areas evaluated during these inspections include, but are not limited to:

- Housekeeping procedures.
- Waste storage procedures.
- Underground Storage Tanks (UST) management and record keeping.
- Control of unauthorized waste disposal.
- Areas of concern to facility supervisors.

These compliance inspections are documented on the Quarterly Environmental Inspection Report, with copies provided to SPSA’s Director of Environmental and Safety Management, Director of Operations, and to the facility supervisor and superintendent. A sample copy of this inspection report may be found in Appendix B of this Operations Manual.

7.5 POST-CLOSURE INSPECTIONS

The site will be inspected regularly according to the frequencies listed in § 4.0 of the Post-Closure Plan (Permit Module XIII). Areas to be evaluated include:

- Condition and effectiveness of final cover system.
- Proper functioning of leachate collection system.
- Condition of groundwater and surface water monitoring equipment.
- Condition and proper operation of landfill gas monitoring and control equipment.
- Proper maintenance of run-on/run-off controls.

7.6 OTHER INSPECTIONS

In addition, Virginia's Department of Labor and Industry and the VDEQ conduct unannounced inspections of the Landfill. Hampton Roads Sanitation District also inspects this facility semiannually.

SECTION 8.0
REGIONAL LANDFILL CONTINGENCY PLAN

8.1 INTRODUCTION

In the event of a non-emergency situation that interrupts normal operating procedures at the Landfill, the following contingency plan will be implemented. A non-emergency situation may include equipment breakdown, personnel illness or absence, extension of operation hours, or diversion of solid waste to other facilities.

8.2 EQUIPMENT BREAKDOWN

Backup equipment for the Landfill is available from the transfer stations or from SPSA's Fleet Maintenance Shop located in Portsmouth.

8.3 PERSONNEL ILLNESS OR ABSENCE

Landfill personnel should notify their supervisor as soon as possible if illness or other circumstances will prevent them from reporting to work, or prohibit them from performing their job responsibilities. Employees are versatile in their work activities which enables them to perform the duties of other positions. The Landfill supervisors are capable of fulfilling the duties of all positions at the facility. If the number of available employees is insufficient to safely operate the Landfill, temporary employees may be hired, or qualified personnel from other SPSA facilities may be utilized.

8.4 DIVERSION OF SOLID WASTE OT OTHER FACILITIES

- In the event of a situation that requires complete shut down of Landfill operations, the following measures will be implemented:
- Commercial, residential, and municipal customers will be directed to other facilities within SPSA's waste system to dispose of their solid wastes.
- SPSA vehicles will haul waste to be landfilled to private disposal facilities within or adjacent to SPSA's service area.
- Private facilities that may be utilized include:
    - Bethel Landfill - located at 100 North Park Lane, Hampton, VA
    - Atlantic Waste Disposal - located at 3474 Atlantic Lane, Waverly, VA

SECTION 9.0

REGIONAL LANDFILL EMERGENCY PLAN

9.1 PURPOSE

This Emergency Plan has been developed to minimize hazards to personnel and the environment in the event of fire, explosion, or any unplanned release of waste or waste constituents at the Landfill. The plan describes actions to be taken to provide for an orderly and effective transition from normal conditions to emergency operations, and will be implemented for emergencies at any facility on the Landfill site including the Yard Waste Composting Facility; Ferrous Metals Processing Plant; Tire Shredding Facility; and Landfill Gas Recovery Power Plant. When applicable, procedures specific to a facility are described. ***Emergency Contact information for the Landfill and its ancillary facilities may be found at the end of this section of this Operations Manual.***

9.2 EMERGENCY COORDINATORS

Individuals filling the following positions are trained to act as the Emergency Coordinator of the Landfill. The names, addresses, and phone numbers of individuals currently holding these positions are listed on the emergency notification sheet located at the end of this section of this Operations Manual.

Primary	Landfill Superintendent
Secondary	Landfill Supervisors

9.3 FIRE CONTROL PLAN

9.3.1 Fire on Landfill Working Face

Open burning is not permitted at the Landfill. Fires that develop spontaneously at the Landfill working face will be extinguished by covering the burning area with soil. An ample supply of soil is stored near the working face during operational hours. The following actions should be taken if a fire develops at the working face.

1. Notify the supervisor of the existence of the fire.
2. If the supervisor determines the fire is controllable, follow the supervisor's instructions. Compactors should be used to cut and push burning garbage away from working face and cover it with dirt until fire is extinguished.
3. If the supervisor determines the fire to be uncontrollable, evacuate the area immediately using predetermined evacuation paths.
4. Concurrently, the supervisor notifies the dispatcher via two-way radio that a fire has developed on the Landfill and the status of the fire. If determined that the fire is uncontrollable, the supervisor will advise the dispatcher to call 911 for fire and rescue.

If the fire is deemed to be controllable, the dispatcher will inform the authorities of steps taken to control the fire and also when the fire is extinguished. The dispatcher will inform the scale attendant that no additional waste disposal vehicles may enter the Landfill until the fire has been extinguished. The dispatcher will dispatch a vehicle to the Landfill entrance to escort emergency vehicles to the location of the fire.

5. The supervisor and landfill employees will assist fire and rescue personnel as directed by the senior fire officer.
6. The supervisor will ensure that all emergency equipment is prepared for reuse before resuming normal operations.
7. The supervisor will alert the dispatcher when the fire is extinguished and when normal operations can resume.

9.3.2 Fire in Landfill Equipment

The main goal in controlling a fire involving landfill equipment is for the equipment operator to evacuate to safety. A 1,500-gallon capacity water truck is kept near the working face at all times during operational hours to provide a source of water to soak equipment to enable the occupant to escape. The following steps should be followed in case of a fire involving landfill equipment.

1. Evacuate the equipment immediately upon discovery of a fire.
2. Inform the supervisor of the exact location of the fire, the equipment involved, and whether any individuals remain on the equipment.
3. Follow the supervisor's instructions to control the fire to allow rescue of injured individuals remaining on the equipment.
4. Concurrently, the supervisor notifies the dispatcher via two-way radio of the existence of the fire involving equipment and if any personnel are injured and/or remain in the equipment. The dispatcher will call 911 for fire and rescue if needed. The dispatcher will dispatch a vehicle to landfill entrance to escort emergency vehicles to the location of the fire. The dispatcher will also alert the scale attendant that no additional vehicles should be allowed to enter the Landfill until the fire is extinguished.
5. If the supervisor deems the fire to be controllable and no injuries have occurred to personnel, the fire will be extinguished by appropriate measures (water from water truck and/or fire extinguisher).
6. If the supervisor determines assistance from local fire and/or rescue squad is required, efforts to control the fire to prevent spreading will be taken until the fire and rescue-squad arrives. These measures include:
    - Performing preliminary first aid on injured personnel

- Continuing to soak burning equipment with water from water truck
- Moving other equipment from vicinity of burning equipment
- Directing vehicles currently unloading waste away from the disposal area.

9.3.3 Fire in Landfill Gas Recovery Facility

In the event of a small, localized fire at the Power Plant, operating personnel may attempt to extinguish the fire using chemical fire extinguishers maintained on-site or inert materials as directed by the maintenance supervisor. If the fire cannot be controlled immediately, evacuate the area at once and alert dispatcher to call the fire department.

9.3.4 Fire Control at the Tire Processing Facility

Fire control and prevention is effected at the Tire Processing Facility through the maintenance of 50-foot fire breakers between tire stockpiles and between a pile and the facility property boundary and any building or structure located on the facility property. The 50-foot separation areas are maintained free of obstructions and vegetation at all times and in such a manner that emergency vehicles will have adequate equipment access. Should a fire develop at the Tire Processing Facility, the following procedures should be followed:

1. Notify the Landfill Superintendent, or the highest-ranking supervisor on duty, of the existence and location of the fire. Additional vehicles will be prevented from entering the Tire Processing Facility.
2. If the supervisor determines the fire is small, localized, and electrical in nature, follow instructions to extinguish the fire using the portable CO_2 fire extinguishers available on-site. All mechanical equipment should be shut down.
3. If the fire is determined to not be electrical, and/or has spread to the tire stockpiles or the office building, the supervisor will order the facility to be evacuated. The supervisor will alert the dispatcher of the fire who will, in turn, contact the fire department and the Landfill Emergency Coordinator.
4. Operators of vehicles present at the Tire Facility should turn off the vehicles and evacuate the site.
5. The dispatcher will alert the supervisor of the Ferrous Metal Processing Facility and Soilex of the existence of the fire at the Tire Processing Facility and that evacuation is necessary. The supervisor of these facilities will shut down processing equipment and order employees to evacuate the site.
6. The point of assemblage for evacuation is the parking lot of the Administrative/Maintenance Building.
7. The dispatcher will alert the scale attendant that no additional waste vehicles should be allowed to enter the site.

8. Follow the supervisor's instructions to assist in rescue and evacuation of injured personnel.

9. The dispatcher will dispatch a vehicle to the Landfill entrance to escort emergency vehicles to the location of the fire.

9.3.5 Reporting of Fire Incident

The supervisor will prepare a written report describing the details of the incident. The report should be submitted to SPSA's Director of Operations and Safety Administrator within three business days and, at a minimum, shall contain the following information:

- Date and time fire was discovered.
- Name of individual discovering fire.
- Name of any injured personnel and nature of such injuries.
- Steps taken to control/extinguish fire.
- Whether assistance from local authorities was required.
- Time fire was extinguished.
- Steps taken to ensure emergency equipment was restored to intended use.
- Time normal operations resumed.
- Suspected cause of fire.
- Steps taken to reduce risk of incident recurring.

9.4 GENERAL EMERGENCY PLAN

The provisions of this Plan will be carried out immediately whenever there is a fire, explosion, or any unplanned release of waste or waste constituents at the Landfill.

9.4.1 Fire

In the event of a fire at the Landfill, the procedures outlined in the Fire Control Plan will be implemented.

9.4.2 Explosion

In the event of an explosion at the Landfill, the following procedures should be followed:

1. Evacuate to an area of safety.

2. Assist in rescue of injured personnel.

3. The supervisor will notify dispatch of the occurrence of the explosion and the results of such explosion (fire, injured personnel, and malfunctioning equipment). The dispatcher will dial 911 as instructed by the supervisor. The dispatcher will alert the scale attendant that no additional waste vehicles should be allowed to enter the facility. A vehicle will be dispatched to the entrance of the facility to escort emergency vehicles to scene of the explosion.

4. Fires that occur as a result of the explosion will be controlled whenever possible.
5. The supervisor and Landfill employees will assist fire and rescue personnel as directed by the Senior Fire Officer.
6. The supervisor will ensure that all emergency equipment is prepared for reuse before resuming normal operations.
7. The supervisor will alert the dispatcher when the situation is under control and normal operations can resume.
8. The supervisor will prepare a written report of the incident and submit it to the Safety Administrator within three working days.

9.5 RELEASE OF WASTE OR WASTE CONSISTUENTS

In the event of a release of waste or waste constituents to soil, air or water as a result of inclement weather conditions or another emergency situation, the main objectives are as follow:

- Containing the release to prevent spreading onto other areas.
- Removal of waste or waste constituents in a timely manner to prevent health or safety hazards or damage to property or environment.

Procedures to be followed in case of a release of waste or waste constituents follow.

9.5.1 Waste

In the event waste should be blown, spread, or dropped outside the boundaries of the landfilling area, it will be removed and properly disposed of in a permitted facility. If necessary, the state police will be called upon to assist in traffic routing to enable waste present on nearby highways or interstates to be safely removed.

9.5.2 Leachate

In the event of leachate overflow from the lagoon, excess leachate will be pumped to HRSD. In addition, two 6,500-gallon tanker trucks are available to pump and transport leachate off-site to a wastewater treatment plant. If necessary, engineering structures such as dikes and/or berms will be utilized to prevent leachate from entering local waterways. The VDEQ-Water Division will be notified of any unpreventable discharge into nearby waterways.

9.5.3 Landfill Gas

Whenever the results of gas monitoring indicate concentrations of methane are in excess of applicable compliance levels, the following actions should be taken:

1. Immediately extinguish all smoking materials.
2. Take all steps necessary to protect public health and safety (evacuation, etc.).

3. Notify SPSA's Safety Administrator at (757) 393-5741 (cellular (757) 418-0296) and Director of Environmental & Safety Management at (757) 420-4700 (cellular (757) 418-0508).
4. Follow the instructions of the Safety Administrator.

In case of gas leak within the Landfill Gas Recovery Plant, immediately cease operations until source of gas leakage has been identified and eliminated.

9.6 ACCIDENT/INJURY RESPONSE AND INVESTIGATION

9.6.1 Injury

In the event of an injury or illness, the following procedures should be followed:

1. Report injury or illness immediately to the Landfill supervisor, even if it appears to be minor.
2. Take the necessary actions to secure the scene to prevent further damage to property or personal injuries (i.e., shut down all equipment).
3. Determine location and severity of injury.
4. If it is determined that the injury is serious, phone the rescue squad at 911. Describe the site location, location of the injured person(s), and the nature of the injury. If the victim requires medical attention but ambulance service is not deemed necessary, transport victim to nearby approved medical facility.
5. Do not attempt to move the victim unless in danger or if the victim can move himself without a great deal of pain.
6. Notify Emergency Coordinator.
7. If necessary, call 911.
8. The supervisor will investigate circumstances and possible causes of the accident and complete an accident report.

9.6.2 Accident Investigation/Reporting

The supervisor of the employee involved immediately following the accident shall investigate each accident. The supervisor's Accident/Injury Investigation Report should be completed as a part of the investigation. The following procedures should be used as a guideline:

1. Check the scene
    a. Carefully examine the accident scene.
    b. Reconstruct the chain of events leading to the accident to determine cause.

   c. Draw a diagram of the scene to assist the Safety Committee in determining contributing causes of accident.
   d. Note all facts that relate to cause of accident and document the following:
      - Facts that may relate to the cause of the accident.
      - Procedures used or misuse of equipment.
      - Any unsafe conditions, acts or faulty equipment involved.
      - Weather conditions.
      - Conversations pertinent to the case.

2. Collect evidence.

3. Interview witnesses and victim.

4. Determine cause(s) of accident.

5. Complete Accident Investigation Report and submit to the Safety Office.

9.7 EVACUATION PLAN

In the event of an emergency situation that requires evacuation, the following procedures should be followed:

1. SPSA personnel will direct vehicles unloading waste away from disposal area. Vehicle operators will be instructed to check in with the scale attendant before leaving the site.

2. Landfill employees will exit the disposal area using SPSA 4x4 vehicles and/or SPSA tractor-trailers. The supervisor will notify the dispatcher if additional vehicles will be needed to safely evacuate the disposal area.

3. The point of assemblage for all Landfill employees will be the parking lot of the Administration/Maintenance Building.

4. The supervisor will account for all employees.

5. If necessary, the state police will be called upon to direct traffic leaving the site.

9.8 EMERGENCY EQUIPMENT

Table 7 provides a list of the types and location of emergency equipment available at the Landfill.

Table 7
Regional Landfill Emergency Equipment

Equipment Type	Quantity	Location
Large Fire Extinguishers	4	Landfill Shop
Fire Extinguisher	1	Scalehouse
Fire Extinguisher	1	Lunchroom
Fire Extinguisher	1	Main Office
Fire Extinguisher	1	Water Truck
Fire Extinguisher	2	Hydra-Seeder
Fire Extinguisher	1	920 Loader
Fire Extinguisher	2	*2-D.6.H Dozers (1 in each)
Fire Extinguisher	1	D.8 Dozer
Fire Extinguisher	3	**3 Compactors (1 in each)
Fire Extinguisher	1	Motorgrader
Fire Extinguisher	2	2 DJB;s (1 in each)
Fire Extinguisher	1	Volvo
Fire Extinguisher	1	Hitachi Excavator
Fire Extinguisher	1	Rubber Tire Excavator
Fire Extinguisher	1	Ford Backhoe
Fire Extinguisher	1	Ford Flat Bed Truck
Automatic Sprinkler System	1	Landfill Shop
1,500-Gallon Water Truck	1	Landfill Hill
8,000-Gallon Tractor Trailer	1	Parking Lot
Kerosene Heater	1	Office
Chain Saw	1	Office
Flashlight	1	Office

* Bulldozers and compactors have AFGX, multi-purpose dry chemical fire-suppression system with heat sensor.

** In addition to the list of fire fighting equipment provided, a dry fire hydrant has been installed adjacent to the pond on the Landfill. This will provide firefighters a water source to fight the fires.

9.9 ARRANGEMENTS WITH LOCAL AUTHORITIES

This Emergency Plan has been reviewed and approved by the City of Suffolk's Emergency Service Coordinator. This individual is responsible for organizing a coordinated response among various City departments to emergency situations developing in Suffolk. Several copies of this Plan have been provided to the Emergency Service Coordinator for distribution to local fire, police, rescue squads, and medical facilities.

9.10 PLAN DISSEMINATION

Table 8 lists locations where copies of this Emergency Plan will be placed.

Table 8
Emergency Plan Dissemination Location

Location	Address	Phone
Driver Volunteer Fire Station	4869 Bennetts Pasture Rd, Suffolk, VA 23435	(757) 538-0519
Whaleyville Volunteer Fire Station	6235 Whaleyville Boulevard Suffolk VA 23438	(757) 514-7599
Chuckatuck Volunteer Fire Station	300 Kings Highway, Suffolk, VA 23432	(757) 514-7596
Holland Volunteer Fire Station	6666 O'Kelly Drive Suffolk, VA 23437	(757) 657-6417
Suffolk Fire & Rescue Station No. 5	3901 Bridge Rd, Suffolk, VA 23435	(757) 514-7570
Nansemond Suffolk Volunteer Rescue Squad	428 Market St Suffolk, VA 23434	(757) 539-6870
Suffolk Police Department	120 North Wellons Street Suffolk VA 23434	(757) 923-2350

9.11 AMENDMENTS TO THE EMERGENCY PLAN

This Emergency Plan will be reviewed and amended as necessary if:

- The facility permit is amended
- The plan fails in an emergency
- Changes in facility design, construction, operation, maintenance, or other circumstances maternally increase the potential for fires, explosions, or releases or change the response necessary in an emergency
- The Emergency Coordinator or emergency equipment list changes.

SPSA REGIONAL LANDFILL
EMERGENCY CALL SHEET

1. *In case of emergency, dial 911!*

2. For emergency situations involving the Regional Landfill:

1° Emergency Coordinator: Landfill Superintendent
Name: Scott Whitehurst
Business Address: #1 Bob Foeller Drive, Suffolk, Virginia 23434
Business Phone: (757) 539-9373, ext. 302
Cellular: (757) 961-3582

2° Emergency Coordinators: Landfill Supervisors
Name: Ronald Williams or Greg Jones
Business Address: #1 Bob Foeller Drive, Suffolk, Virginia
Cellular: (757) 449-6359 or (757) 449-6349

Report accidents to SPSA's Safety Administrator:

Name: Jim Penney
Business Address: 4 Victory Boulevard, Portsmouth, Virginia 23702
Business Phone: (757) 961-3697
Cellular: (757) 418-3570

Report environmental incidents to SPSA's Environmental Supervisor II

Name: Mac Burgess
Business Address: #1 Bob Foeller Drive, Suffolk, Virginia
Business Phone: (757)539-9373 ext 303
Cellular: (757) 449-6351

Report facility security matters to:

Name: Scott Whitehurst
Business Phone: (757) 961-3582
Cellular: (757) 449-5349

Emergencies involving the Suffolk Transfer Station

Name: Darryl Durham
Business Phone: (757) 961-3627
Cellular: (757) 417-5365

SPSA REGIONAL LANDFILL
EMERGENCY CALL SHEET
(Continued)

Emergencies involving the Tire Processing Facility

Name: Brian Ogle
Business Phone: (757) 961-3668

Emergencies involving Bi-Metals Ferrous Metal Recovery Facility:

Name: David Tyler
Business Phone: (757) 934-3254

Emergencies involving Soilex

Name: Jack Ruffin
Business Phone: (757) 549-8448

Emergencies involving US Energy Biogas Corporation (Methane Recovery Plant)

Name: Steve Laliberty
Business Phone: (843) 414-4604
Cellular: (631) 334-7308

3. Suffolk Police Department: (757) 923-2350

4. Suffolk Department of Fire and Rescue: (757) 514-7550

5. Poison Control Center: (800) 552-6337

6. Virginia State Police: (757) 382-4998

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APPENDIX A

Recognizing and Responding to Regulated Medical Waste

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APPENDIX A
Guidelines for Identifying and Responding to Regulated Medical Waste

SPSA employees should always be aware of the risks associated with solid waste management. Despite efforts to avoid accepting regulated medical waste at SPSA's facilities, it is still possible that you may encounter regulated medical wastes (RMW) among other solid wastes in the performance of your duties. Additionally, some wastes that appear to be RMW may not meet regulatory definition of RMW and are, therefore, acceptable for disposal at SPSA's facilities. It is important that you be able to recognize RMW and also be familiar with the procedures to follow should you encounter them at any SPSA facility.

The following guidelines have been developed for your health and safety and should be followed whenever RMW is suspected at a SPSA's facility. To implement these procedures, a clear understanding of the definition of RMW is needed. Virginia's RMW Regulations (9 VAC 120-140 et seq.) define RMW as those wastes that fall into one of the following categories.

I. Regulated medical waste is defined as:

A. *Cultures and stock of microorganisms and biologicals including*

1. Pathogenic discarded cultures, stocks, specimens, vaccines and associated items. To be pathogenic means being capable of causing disease to healthy humans.

2. Discarded etiologic agents (used to detect disease) are regulated medical wastes. Wastes from the production of biologicals and antibiotics likely to have been contaminated by organisms likely to be pathogenic to healthy humans are regulated medical wastes.

B. *Blood and blood products, including:*

1. Wastes consisting of human blood products (includes serum, plasma, etc.) and items contaminated by human blood.

2. Materials that are visibly saturated with blood and blood products, i.e., gauze, bandages, linens, etc., that are not adequately absorbed.

C. *Tissues and other anatomical wastes, including all human anatomical wastes and all wastes that are human tissues, organs, body parts, or body fluids.*

D. *Sharps likely to be contaminated with organisms that are pathogenic to healthy humans including:*

1. Those used in patient care or veterinary practice and syringes without needles.

2. Other "potentially sharp" items likely to be contaminated with pathogenic organisms and have sharp edges (i.e., scissors, scalpels, lances, etc.).

E. Animal carcasses, body parts, bedding and related wastes that have been intentionally infected with organisms likely to be pathogenic to healthy humans for the purposes of research, in vivo (living organisms) testing, production of biological materials, or any other reason.

F. Any residue or contaminated soil, water, or other debris resulting from the cleanup of a spill of any regulated medical waste.

G. Any solid waste contaminated by or mixed with regulated medical waste.

H. Any waste material that is suspected by a health care professional of being capable of producing infectious diseases in humans and/or is contaminated with any type of bodily fluid or excrement.

II. Items Excluded from Regulation

A. Used products for personal hygiene, such as diapers, facial tissues, or sanitary napkins.

B. Materials (excluding sharps), containing small amounts of blood or body fluids, but containing no free flowing or unabsorbed liquid.

III. Important Information

The disposal of some medical wastes is governed by state regulations, while other medical wastes are excluded or exempt from the regulations. The applicability of the regulations does not determine the level of risks. All medical waste should be handled with extreme caution! Contact with regulated medical wastes should be avoided whenever possible, but in the waste business, we can realistically only minimize the risks through awareness, training, and the proper utilization of personal protective equipment (PPE). The acronym CARE serves as a reminder to use extreme care when suspected medical waste is encountered.

- **C -** Be **cautious** when handling any and all wastes.
- **A -** Be **aware** of the risks associated with waste exposure.
- **R -** Be **reasonable** and use common sense in handling waste. Don't scavenge, don't panic.
- **E -** Be **educated** about how to identify regulated medical waste and how to respond appropriately.

IV. Response Procedures

If regulated medical waste is discovered or suspected at any SPSA facility, the following actions should be taken.

A. The facility supervisor or designated person-in-charge (PIC), should isolate the offending waste from human contact. It is preferred that the suspect waste remain where it was ejected; however, if this is not possible, heavy equipment can be used to push the waste to an area of the facility where it is out of the way of traffic.

B. The supervisor should monitor the suspect waste to ensure human contact with the waste is prohibited.

C. The facility supervisor or PIC should gather as much information as possible regarding the disposal of suspected regulated medical waste. This should include:

- The date, time and location of the incident.
- The waste transporter, truck number, box number.
- The waste generator's name.
- Any other relevant information.

D. The facility supervisor or PIC, should contact Scott Whitehurst, Environmental Supervisor II, or any Environmental Specialist. The contact numbers are as follows:

Name	Office Number	Cell Phone Number
Scott Whitehurst	(757) 539-9379	(757) 449-5349
Gordon Briggs	(757) 539-9373, ext 305	(757) 418-3564
Glenda Dodson	(757) 539-9373, ext 305	(757) 418-3563
Robert Scott	(757) 539-9373, ext 305	(757) 418-0510
Chris Stallard	(757) 393-5780	(757) 418-0517
Charles Williams	(757) 539-9373, ext 305	(757) 418-3562

E. The Environmental Supervisor II or Specialist will determine if the suspect waste is a NRMW. If he or she confirms that the waste is RMW, the following actions will be taken:

- The Supervisor or Specialist will collect the vital incident information from the facility supervisor.

- The Supervisor or Specialist will notify VDEQ and begin the process of having the waste properly removed. If the waste generator can be positively identified, he/she will attempt to contact the responsible party, preferably a supervisor.

- If the waste generator is licensed to transport regulated medical waste and if authorized by VDEQ, the generator will be allowed to remove the waste.

- If the waste generator is not licensed to transport regulated medical waste, a licensed medical waste contractor will be called in to remove the waste and the generator will be billed for the cost of disposal.

- SPSA personnel should not assist in the cleanup and removal of RMW; however, SPSA equipment (loaders, et al.) may be used to load the waste into a vehicle that is licensed to transport RMW.

- Equipment that comes into contact with RMW should be immediately decontaminated using household bleach. This can be accomplished by thoroughly applying bleach to the affected areas, allowing it to stand for at least one minute, then hosing off. This procedure should be applied to all surfaces that come in contact with the RMW. All facility supervisors should ensure that at least 10 gallons of household bleach is on hand at all times.

- The supervisor should monitor the site to assure that all RMW wastes are properly and thoroughly removed. The attending Environmental Specialist will remain on-site until the removal of the waste has been completed and it is determined to be safe to resume normal operations.

- The Environmental Specialist is responsible for completing all necessary reports that VDEQ requires. Facility supervisors will assist as needed to perform this task.

- Records of incidents involving RMW should be maintained and filed at the facility for a period of three years.

APPENDIX B

Inspection Checklists

Daily Inspection Sheet
Load Checking Inspection
Quarterly Safety Inspection
SPSA Safety Programs
Quarterly Environmental Inspection Report
Gas Monitoring Event Log

Regional Landfill Daily Inspection Sheet

Week of: ______________________________________

Weather Checks

Day	Source (Check one)	Forecast	Initials
Monday	☐ SPSA Weather Station ☐ Ntl' Weather Service		
Tuesday	☐ SPSA Weather Station ☐ Ntl' Weather Service		
Wednesday	☐ SPSA Weather Station ☐ Ntl' Weather Service		
Thursday	☐ SPSA Weather Station ☐ Ntl' Weather Service		
Friday	☐ SPSA Weather Station ☐ Ntl' Weather Service		
Saturday	☐ SPSA Weather Station ☐ Ntl' Weather Service		

Day	Mon	Tues	Wed	Thu	Fri	Sat
Date						
Time						
	Initial or check indicating item has been inspected.					
All Weather Roads						
Roads clear of mud deposits and fugitive dusts						
Roads passable and free of litter and debris						
Roads suitable for current weather conditions						
Leachate Collection System						
Reset circuits (if necessary)						
Water table at the appropriate level						
Pumps and aerators functioning properly						
Gravity flowing through collection system						
Meter reading indicating gallons pumped						
Cover Maintenance						
Intermediate cover applied as required to areas not receiving waste for 30 days						
Intermediate cover free of cracks, erosion and uneven areas						
Three days of cover material available on site						
Finished areas graded and seeded						
Vegetative cover established in finished areas						
Safety Checks						
Pre-start checks performed on equipment						
Employees using appropriate personal protective equipment						
Dust levels do not pose hazard to personnel						
Sufficient queuing personnel on site						
Fire extinguishers and other emergency equipment available and ready for use						
Housekeeping						

Day	**Mon**	**Tues**	**Wed**	**Thu**	**Fri**	**Sat**
Date						
Time						
	Initial or check indicating item has been inspected.					
Drainage ditches free of leachate, litter and debris						
Working face being kept as small as practicable						
Maximum lift height less than 10 feet						
Odor controlled as to not constitute a nuisance						
Inspected by (Initials)						

Notes/Comments

SPSA

LOAD CHECKING INSPECTION REPORT

Date: ______________ Time: ______________ Facility: __________________________________

Hauler: ____

Truck #: ______________ Box #: ________________ License Plate #: ______________________

Source of Waste: ____

Type of Waste: ____

Check one of the following:

☐ Driver waited Driver's Name: ______________________________

☐ Driver elected not to wait Driver's Signature: ____________________________

Findings

Is there unauthorized waste (hazardous waste, regulated medical waste, etc.) in the load?

☐ No. No further action necessary. Sign the form below.
☐ Yes. If yes, indicate type of waste below.
  ☐ Hazardous waste
  ☐ Regulated medical waste
  ☐ PCB waste
  ☐ Other ____

Description of Waste: (Include estimated quantity, packaging, label information, etc.)

____

____

____

Actions Taken:

____

____

____

____

Inspected by: __________________________________ Date_____________________________

__________________________________ Date: ___________________________

Any suspected hazardous waste, regulated medical waste, PCB waste or otherwise unauthorized waste may require reporting to the Virginia Department of Environmental Quality. Any questions regarding unauthorized waste including reporting requirements should be directed to the Special Waste Manager at (757) 539-9373, ext. 306.

QUARTERLY SAFETY INSPECTION REPORT

Location: ____________________________________

Date:______________________________________

Inspector:____________________________________

Discrepancies	
Long-Term	
Repeat	
New	
Total	

Distribution:

- Rowland Taylor, Executive Director
- Louie Jordan, Deputy Executive Director
- (Department Head)
- Scott Whitehurst, Superintendent of Environmental Management
- Elizabeth Harris, Safety Administrator
- (Superintendent/Manager)
- (Supervisor/s)

SPSA Safety Programs

Hazard Communication Program

The Worker-Right-to-Know Station is located ________ and was reviewed in ___________.

Handbook of Safety Policy Directives

The Handbook is located _______ and is up-to-date.

CPR & First Aid

The following employees are currently certified:

First Aid Kit

The First Aid Kit is located ___________ and is well-stocked, including a barrier mask.

Unsafe Work Condition Reports

Unsafe Work Condition Reports are available at _______________

Department of Labor and Industry Poster

Poster is posted on the bulletin board.

Training Records

Monthly in-house safety training is conducted and documented in training records that are maintained in supervisor's office.

Respiratory Protection Program

Facility is in compliance. Documentation of monthly inspections is maintained in supervisor's office.

Confined Space Program

No confined space entries during the last quarter.

Emergency Response Procedures

Employees are trained in Emergency Response Procedures.

Hearing Conservation

Employees received annual audiometric testing in _________.

Personal Protective Equipment

All employees were wearing appropriate PPE during the inspection. Spare PPE is available as needed.

Long-Term Discrepancies

#	Description	Date First Noted	Corrected by (initials)	Date Corrected

Repeat Discrepancies

#	Description	Date First Noted	Corrected by (initials)	Date Corrected

New Discrepancies

#	Description	Corrected by (initials)	Date Corrected

Corrected Discrepancies

The following discrepancies were noted as being corrected:

Description	Date First Noted	Disposition

Comments

(signed)____
Safety Specialist

SPSA

Quarterly Environmental Inspection Report

Location: Regional Landfill

Date of Inspection:

Names of Inspector: Mac Burgess

Report Sent to:

Department Heads: Rowland Taylor, Executive Director

Superintendent: Scott Whitehurst

Supervisor: Greg Jones and Ron Williams

Past Discrepancies	
Current Discrepancies	
Total Discrepancies	

1. 10.1-1408.2 Operator Certification

- Date of certification: ______________________
- Certification expires: ______________________

2. 20-80-113 Control program for unauthorized waste

- Is the plan onsite?
- Have there been any incidents where removal of waste was necessary?

3. 20-80-340.C.1 All weather roads

- (From entrance gate to unloading, receiving, or tipping area)
- Are all weather roads in good condition?

4. 20-80-340.C.2 Tipping area

- Is tipping area in good condition?
- Last washdown of tipping area:

5. 20-80-340.C.3 Wheel curb/safety facilities

- Is there a mechanism to prevent one from falling into pit of tipping area?

6. 20-80-340.C.4 Easily cleanable materials

- Are unloading, receiving, tipping, and storage areas of an easily cleanable material?

7 20-80-340.C.5 Sufficient queuing capacity

- Is there sufficient queuing capacity so waiting vehicles do not back on public road?

8. 20-80-340.C.6 Management of household hazardous waste

- Is HHW facility in good condition?

9. 20-80-340.C.7 Waste storage

- Is waste stored overnight?
- If so, are there storage units designed to reduce potential for fires, migration of vectors, and to prevent escape of wastes, wash waters, odors, dust, and litter from facility?

10. 20-80-340.D.1 Solid waste remaining/day

- Ensure there is no non-containerized waste at the end of the day

11. 20-80-340.D.2 Written operating plan

- Capacity: _____________ tpd Transfers: ______________ tpd
    - Is an operating plan onsite?
    - Condition of grounds and parking lots:
    - Condition of stormwater outfalls and drainage ditches:
    - Any windblown debris onsite?
    - Windblown debris last picked on:
    - If applicable, are roll-off boxes clean?

12. 20-80-340.D.3 Written contingency plan

- Is contingency plan on-site?

13. 20-80-340.D.4 Management of leachate/wastewater

- Leachate and wash water not permitted to drain or discharge into surface waters.

14. 20-80-340.D.5 Hazardous waste and household hazardous waste

- No regulated hazardous wastes shall be accepted and storage of HHW shall not exceed a year.
- Any hazardous waste incidents?

15. 20-80-340.E.2 Closure Plan

- Is the closure plan onsite?

UST Management

Number on Site: ______________

ID#	Date Installed	Capacity	Description	Release Detection	Release Detection Records (previous year)

DISCREPANCIES

1.

2.

3.

GENERAL OBSERVATIONS AND COMMENTS:

1.

2.

3.

____

Amy Hardy, Environmental Compliance Coordinator

Regional Landfill Gas Monitoring Event Log

Date: ____________________ Temperature: ________________

Barometric Pressure: __________ Weather Conditions: ________________

Instrument: ____________________ Calibration Date/Time: ________________

Calibration Verification: __________ LEL __________ Oxygen

Environmental Specialist: ____

Cells I-IV

Probe ID	Time	Screen Depth	Concentration			Probe Pressure inches/wc
			LEL	Oxygen	Methane	
GP-1 (S)						
GP-1 (D)		8.3 - 9.3				
GP-2 (S)						
GP-2 (D)		8.4 - 9.4				
GP-3 (S)						
GP-3 (D)		8.5 - 9.5				
GP-4 (S)						
GP-4 (D)		8.4 - 9.4				
GP-5 (S)						
GP-5 (D)		8.5 - 9.5				
GP-6 (S)						
GP-6 (D)		8.4 - 9.4				
GP-7 (S)						
GP-7 (D)		8.4 - 9.4				
GP-8 (S)						
GP-8 (D)		8.5 - 9.5				
GP-9 (S)						
GP-9 (D)		8.5 - 9.5				
GP-10 (S)						
GP-10 (D)		8.5 - 9.5				
GP-11 (S)						
GP-11 (D)		8.4 - 9.4				
GP-12 (S)						
GP-12 (D)		8.5 - 9.5				
GP-13 (S)						
GP-13 (D)		8.5 - 9.5				
GP-14 (S)						
GP-14 (D)		8.5 - 9.5				
GP-15 (S)						
GP-15 (D)		8.5 - 9.5				
GP-16 (S)						
GP-16 (D)		8.4 - 9.4				

Cells V - VII

Probe ID	Time	Screen Depth	Concentration			Probe Pressure inches/wc
			LEL	Oxygen	Methane	
GP-22						
GP-24						
GP-25						
GP-26						
GP-27						
GP-30						
GP-32						
GP-33						
GP-34						
GP-35						
GP-36						
GP-37						
GP-38						
GP-39						
GP-40						
GP-41						
GP-42						
GP-43						
GP-44						
GP-45						

On-Site Structures

Structure ID	Time	Concentration		
		LEL	Oxygen	Methane
Scale house				
LDF Admin. Bldg.				
LDF Storage Bldg.				
LDF Wash Facility				
Bi-Metals Office				
Bi-Metals Plant				
Tire Shredder Office				
Tire Shredder Shed				
Soilex Admin. Bldg.				
Soilex Shop Office				
Soilex Storage Container				
Soilex Bug House				
Yard Waste Office				
Yard Waste Bag Shed				
Yard Waste Storage Shed				
Leachate Pump Shed				
U.S. Energy Office				
U.S. Energy Storage				

APPENDIX C

Summary of Operations of the Soilex Soil Remediation and Treatment Facility

APPENDIX C
Soilex Corporation Suffolk Plant
Summary of Operations

I. General Information

The Soilex Treatment Plant is located on a 2.74-acre parcel on the southeastern corner of the Landfill, adjacent to the pond and behind the Tire Processing Facility. The Soilex Facility has an annual design capacity of 40,000 tons and a process capacity of 300 tpd. The facility's function is to treat and dispose of petroleum contaminated soils and other non-hazardous waste materials. Four employees operate the Soilex facility. The facility began operating in August 1999.

II. Description of Accepted Materials

The Soilex Facility accepts soils and other non-hazardous solids that are contaminated with petroleum products such as gasoline, diesel fuel, heating oil, and motor oil. Most of the incoming soils are the products of leaking UST removals, utility projects, or emergency spill clean-up activities.

III. Description of Soilex's Customers

The customers of the Soilex Corporation include major oil companies, industrial and manufacturing facilities, municipalities, and the Department of Defense (DOD). Additionally, residential customers who have petroleum spills or are removing heating oil tanks from their homes deliver materials to the Soilex Facility.

IV. Description of Treatment Process

Customers must demonstrate the non-hazardous nature of any waste materials intended for the Soilex Facility, prior delivery of such waste to the facility. This demonstration is made by laboratory analysis of a representative sample of the material.

All incoming material is unloaded directly from the truck onto the concrete tipping floor. The material is then moved from the tipping floor to the screening device that is located adjacent to the building, where debris, wood, and plastic are removed. The screened material is moved onto the final conveyor belt and sprayed with two solutions. The first solution is a nutrient used to enhance the aerobic decomposition of the petroleum within the soil. The second solution contains naturally occurring bacteria that have been cultivated to consume only petroleum hydrocarbons. The treated material is then placed in separate stockpiles inside the Facility for a period of 72 hours. All steps in the above process are repeated.

After the treatment process is complete, the material is stockpiled and stored inside the Facility for seven to ten days to allow for the complete breakdown and consumption of the remaining petroleum hydrocarbons. Samples of the final product are collected for analysis by an independent laboratory to confirm they meet the criteria for clean soil, as defined by applicable regulations. Once confirmed, the material is ready for transportation and disposal.

V. Transportation and Disposal of Final Product

The final product is transported to the Landfill working face to be used as daily cover material. Additionally, it is used for Landfill slope and road construction. Materials in excess of SPSA's needs are disposed of at the Landfill at the normal disposal fee.

APPENDIX D

Regional Landfill Permits

HRSD Industrial Wastewater Discharge Permit

Special Exception to Withdraw Groundwater

Title V Operating Permit

VPDES Permit

HAMPTON ROADS SANITATION DISTRICT

HRSD
P.O. BOX 5902, VIRGINIA BEACH, VIRGINIA 23471-0902 • (757) 460-7045 • FAX: (757) 464-3985

www.hrsd.com

February 14, 2008

Certified Mail/Return Receipt 7006 2760 0005 4929 3422

Ms. Amy Hardy
Environmental Compliance Coordinator
Southeastern Public Service Authority of Virginia
723 Woodlake Drive
Chesapeake, Virginia 23320

RE: Regional Landfill

Dear Ms. Hardy:

Enclosed is HRSD Industrial Wastewater Discharge Permit No. 0087. Please note the following revisions to your permit.

- The addition of Cyanide (CN$^-$) to be sampled monthly in monitoring requirements on Page III.

Please discard all current Permit pages and replace with this revised Permit.

Should you have any questions, please feel free to contact Ms. Christel L. Dyer of this office at (757) 460-7044 or Facsimile, (757) 464-3985.

Sincerely,

Ronald E. Johnson
Chief of Pretreatment & Pollution Prevention

REJ/mem

Enclosure

cc: Ms. Melinda Woodruff, DEQ, TRO

Hampton Roads Sanitation District
Industrial Wastewater Discharge Permit No. 0087

In accordance with all terms and conditions of the Hampton Roads Sanitation District Industrial Wastewater Discharge Regulations, and in accordance with any applicable provision of Federal or State law or regulation;

Permission is Hereby Granted to: **Southeastern Public Service Authority of Virginia, Regional Landfill, 1 Bob Foeller Drive, Suffolk, Virginia 23434**

Classified by NAICS No. **562212 - Significant Industrial User**

For the contribution of **SPSA Regional Landfill Leachate, SPSA Transfer Station Tipping Floor Wastewater and City of Suffolk, Hoiser Road Landfill Leachate**

into the Hampton Roads Sanitation District at **Nansemond Parkway, Suffolk, Virginia**

This Permit is based on information provided in the Permit application, which together with the following conditions and requirements is considered a part of this Permit. This Permit is not transferable.

Effective **1st** day of **January** 2008

To Expire **31st** day of **December** 2010

General Manager
(By Direction)

EFFLUENT DISCHARGE LIMITATIONS

The following referenced parameters are known to exist in the Permittee's discharge through information provided in the Permit application. The limitations set forth below shall be met at all times. In addition, all other effluent limitations and general discharge prohibitions set forth in the Hampton Roads Sanitation District's Industrial Wastewater Discharge Regulations (7/1/99 Ed.) and all applicable Federal and State limitations shall be met.

Sampling Point Name: **#1 (Leachate Pond)**		
Parameter (reported in mg/L unless otherwise indicated)	Calendar Month Average[1]	Calendar Day Maximum[2]
Arsenic (As)	0.1	0.1
Cadmium (Cd)	0.1	0.1
Chromium, Total (Cr)	2.0	5.0
Copper (Cu)	2.0	5.0
Cyanide (CN^-)	0.5	1.0
Lead (Pb)	1.0	2.0
Mercury (Hg)	0.01	0.02
Nickel (Ni)	1.0	2.0
Phenolic Compounds	1.0	2.0
Silver (Ag)	0.25	0.5
Zinc (Zn)	2.0	5.0
Oil & Grease (SGT-HEM) (O&G)[3]	100	100
pH (s.u.)	≥5.0	≥5.0
Flow (GPD)[4]	95,600	185,500
Toxic Organics (TO)[5]		2.13

[1] Average of any number of daily values obtained during a calendar month.

[2] Maximum for any sample obtained during any calendar day.

[3] There shall be no visible free oil present.

[4] The flow quantities listed are not enforced as Permit limitations.

[5] No single parameter or BTEX concentration shall exceed 1.0 mg/L.

MONITORING REQUIREMENTS

Addendum 02/14/08

The following sample(s) shall be collected as specified:

Sampling Point	Quantity	Type	Frequency	Parameter(s)
Discharge side of the **#1 (Leachate Pond)**	1	Composite[1]	Monthly[2]	As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, BOD_5[3]
Discharge side of the **#1 (Leachate Pond)**	1	Grab	Monthly[2]	pH, CN^-[3], Phenolic Compounds[3]
Discharge side of the **#1 (Leachate Pond)**	1	Composite[4]	Semi-Annually by June 30th and December 31st[5]	TO

[1] Comprised of at least fifteen (15) minute aliquots composited for the discharge day.

[2] On varying process discharge days throughout the month, including weekends when process discharges occur.

[3] All interference procedures must be performed.

[4] Comprised of a minimum of four (4) grab samples collected every hour during the discharge day and composited for laboratory analysis. Volatile organic samples are comprised of a minimum of four (4) grab samples collected every hour during the discharge day which must be composited in the analytical laboratory or the four (4) samples can be analyzed separately and the results averaged.

[5] First sample collected between **January** and **June** and the second sample collected between **July** and **December** of each calendar year in varying months.

Results of *all* analyses (except TO/organic data) for samples collected from the *permitted* sampling points in a calendar month must be received in this office by the tenth (10th) day of the following month (advanced due date). Transmitting data by facsimile is an acceptable method for meeting this deadline. However, all data (except TO/organic data) must be received in this office within thirty (30) days following the advanced due date, accompanied by an appropriately executed certification statement.

The results of TO/organic analyses must be received in this office within thirty (30) days of the sampling date or by the tenth (10th) day of the following month, whichever date is later (advanced due date). Transmitting TO/organic data by facsimile is an acceptable method for meeting this deadline. However, all TO/organic data must be received in this office within thirty (30) days following the advanced due date, accompanied by an appropriately executed certification statement.

All analyses shall be performed in accordance with Section 402 of the HRSD Industrial Wastewater Discharge Regulations.

METERING REQUIREMENTS

Metering shall be as follows:

Quantity	Type	Purpose
1	Effluent	Billing

The effluent meter shall be certified as accurate to manufacturer's specifications annually and a copy of the certification shall be received in this office no later than December 31st of each year accompanied by an appropriately executed certification statement.

A monthly summary of daily effluent meter readings must be received in this office by the tenth (10th) day of the following month. Transmitting summaries by facsimile is an acceptable method for meeting this deadline. However, all summaries must be received in this office within thirty (30) days following this date accompanied by an appropriately executed certification statement.

SPECIAL CONDITIONS

The pretreatment system shall be maintained at all times so as to achieve compliance with the limitations listed on Page II of this Permit. All residual material removed from the pretreatment system shall not be discharged directly or indirectly into the HRSD system.

Permit violations must be reported to the HRSD Pretreatment & Pollution Prevention Division in accordance with Section 302 of the HRSD Industrial Wastewater Discharge Regulations.

The Permittee is responsible for resampling and analysis of any violated parameter based on self-monitoring within thirty (30) days of becoming aware of the violation.

In order for the HRSD Pretreatment & Pollution Prevention Division to accomplish its sampling, the Pretreatment & Pollution Prevention Division must be notified no less than forty-eight (48) hours prior to the first discharge each month from the **#1 (Leachate Pond)**.

In accordance with Section 206 of the HRSD Industrial Wastewater Discharge Regulations, a permit renewal application must be received in this office at least 180 days prior to the expiration date of the existing Permit.

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
SPECIAL EXCEPTION
TO WITHDRAW GROUND WATER

pecial Exception Number: GW0040700
fective Date: January 1, 1998
xpiration Date: December 31, 2007

rsuant to Section 62.1-256 of the Ground Water Management Act of 1992 (Chapter 5, Title 62.1 of the Code of Virginia) and the Ground Water Withdrawal egulation (9 VAC 25-610-10 et seq.), the STATE WATER CONTROL BOARD hereby uthorizes

Owner Southeastern Public Service Authority
Address 723 Woodlake Drive
P.O. Box 1346
Chesapeake, VA 23327-1346

Facility SPSA Regional Landfill

o withdraw and use ground water in accordance with this special exception and h application received September 16, 1996 and subsequently amended.

The owner is authorized to withdraw 10,500,000 gallons per year.

The owner shall comply with all requirements contained on this cover page, the Ground Water Special Exception Standards, Limitations, and Conditions, the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia), and the Ground Water Withdrawal Regulation (9 VAC 25-610-10 et seq.). Nothing in this special exception or this regulation shall be construed to relieve the owner of the duty to comply with all applicable Federal and State statutes and regulations.

The primary beneficial use of the authorized withdrawal will support the development and operation of a landfill by maintaining a ground water gradient toward the site. The ground water withdrawn will, to the extent feasible, be used for secondary beneficial uses on site including irrigation of vegetative cover, vehicle washing, yard waste composting, HVAC operation, and dust suppression. Other primary beneficial uses are not authorized by this special exception. All secondary beneficial uses are encouraged.

Any non-compliance with special exception conditions, the Ground Water Withdrawal Regulation (9 VAC 25-610-10 et seq.) or the Ground Water Management Act of 1992 (Chapter 25, Title 62.1 of the Code of Virginia) is a violation of the regulation and law, and is grounds for enforcement action, special exception termination, revocation, amendment, or denial of a special exception renewal application.

By direction of the STATE WATER CONTROL BOARD
this Special Exception is granted by:

Signed Hassan Vakili For Thomas L. Hopkins Date 12-17-97
For the STATE WATER CONTROL BOARD

Special Exception Standards, Limitations and Conditions

1. The withdrawal of ground water for temporary construction dewatering not exceeding twenty four months in duration is exempt from the withdrawal limits established by this special exception. However, the owner shall meter and report such temporary construction dewatering as described in conditions #4 and #5. In addition, the owner shall continue to meter and report the withdrawals from the existing supply well (DEQ #161-425) for the four standard quarters following the issuance of this special exception.

2. The withdrawal of ground water for permanent dewatering shall originate from the following withdrawal points:

Owner Well Name/#	DEQ Well#	Elevation of Sump Bottom feet msl	Elevation of Pump Intake feet msl	Latitude	Longitude
Dewatering Sump 1 DWS1	161-449	-17	-17	36°45'36"	76°31'14"
Dewatering Sump 2 DWS2	161-450	-21	-21	36°45'26"	76°31'10"
D tering Sump 3	161-451	-17	-17	36°45'40"	76°31'03"
Dewatering Sump 4 DWS4	161-452	-21	-21	36°45'29"	76°31'10"

76 30 5

The owner shall provide as built engineering drawings documenting the construction and pump locations in each sump contained in this condition within 60 days of the completion of construction of each sump. Such drawings shall include the Department of Environmental Quality well identification number, the ground water withdrawal special exception number, the geographic location of the sump, the elevation of the bottom of the sump, the elevation of the withdrawal pump, and the pump capacity, at a minimum.

3 Withdrawals from the withdrawal system are limited as follows :

In a calendar month: Total pumpage from this withdrawal system shall not exceed 1,400,000 gallons. The owner shall report any exceedance of this monthly withdrawal limit by the fifth day of the month following the month of exceedance.

4. The owner shall install in-line totalizing flow meters to read gallons, cubic feet or cubic meters on each sump identified in condition #2 prior to beginning the authorized withdrawal from each sump. Such meters shall produce volume determinations within plus or minus 10% of actual flows. A defective meter or other device must be repaired or replaced within 30 days. A defective meter is not grounds for not reporting withdrawals. During any period when a meter is defective generally accepted engineering methods shall be used to estimate withdrawals and the period during which the meter was defective must be clearly identified in ground water withdrawal reports.

Ground water withdrawal from each sump and total system withdrawal shall be recorded monthly and reported on forms provided by the Department t the Tidewater Regional Office of the Department of Environmental Quality by the tenth day of each January, April, July and October for the respective previous standard quarter. Records of ground water withdrawal shall be maintained by the owner as required in 9 VAC 25-610-130.F. of the Ground Water Withdrawal Regulation.

The owner shall maintain a ground water levels monitoring network composed of the following three monitoring wells:

Owner Well Name/#	DEQ Well#	Depth	Aquifer	Latitude	Longitude
MW-20	161-453		Columbia	° ' "	° ' "
MW-9	161-454	30 feet	Columbia	36°45'29"	76°31'12"
MW-13	161-455	13 feet	Columbia	36°45'42"	76°31'22"

Prior to initiation of any withdrawal under the terms of this special exception, monitoring well MW-20 (DEQ Well #161-453) shall be completed and the owner shall supply a completed well completion report to the Department. The location and construction of this well shall be as described in the application for permit modification for the SPSA Regional Landfill, Cell V expansion, unless prior approval is obtained from DEQ water division staff.

7. The owner shall collect static water level measurements at the thre monitoring wells referenced in condition #6 above on a monthly basis. Water levels measurements shall commence prior to the initiation of any withdrawal governed by this special exception including temporary construction dewatering describied in condition #1. Water level measurements shall be reported quarterly with the withdrawal reports required in condition #5. Records of ground water levels shall be maintained by the owner as required in 9 VAC 25-610-130.F. of the Ground Water Withdrawal Regulation.

8. If the monitoring information required in condition #7 indicates the potential for adverse impacts on ground water levels that are due to this withdrawal, this special exception may be reopened to include ground water level action levels.

9. The owner shall report any claim of adverse impacts on existing ground water users to DEQ within 5 days. Within 15 days of the receipt of any such claim, the owner shall provide DEQ with a written report addressing the validity of the claim of adverse impact. DEQ will evaluate the report and may reopen this special exception to require mitigation of valid claims.

10. Each withdrawal sump that is included in condition #2 of this ground water withdrawal special exception shall have affixed, in a prominent place, a permanent identification plate that records the Department of Environmental Quality well identification number, the ground wat withdrawal special exception number, the elevation of the bottom of t sump, the elevation of the withdrawal pump, and the pump capacity, at a minimum. Such identification plates shall be provided to the owner by the Department after the submittal of the engineering drawings referenced in condition #2.

The owner shall record the amount of ground water withdrawn under the authority of this special exception that is applied to a secondary beneficial use. Such records shall contain the amount of water applied to a secondary beneficial use, the type of secondary beneficial use, and the total amount of water applied to all secondary beneficial uses on a monthly basis. Records of secondary beneficial uses shall be maintained by the owner as required in 9 VAC 25-610-130.F. of the Ground Water Withdrawal Regulation.

2. The owner shall comply with all conditions contained in the Virginia Solid Waste Disposal Permit #417.. Specifically, no withdrawal shall occur in any of the dewatering sumps referenced in condition #2 prior to the owner either amending the monitoring plan included in Module X of the solid waste disposal application to include each underdrain sump as a monitoring point or obtaining a VPDES permit authorizing this discharge.

3. This special exception may be reopened for the purpose of amending the conditions of the special exception to meet new regulatory standards duly adopted by the Board.

4. A new special exception application must be submitted 270 days before the expiration date of this special exception.

5. A new special exception application must be submitted 270 days prior to any proposed modification to this special exception which will result in an increase of withdrawal above authorized limits or violate the terms and conditions of this special exception.

6. This special exception may be reopened for amendment, transfer, or revocation as described in Part 6 of the Ground Water Withdrawal Regulation.

7. The owner must notify the Department in writing and obtain staff approval of any change in the status, construction or pump setting of withdrawal sumps and monitoring wells included in conditions #2 and #6 of this special exception. A revised engineering drawing or well construction report must be submitted to the Department within 30 days in the event that the physical construction of a withdrawal sump or monitoring well is altered or the pump setting in a withdrawal sump is changed.

8. The owner must notify the Department in writing of any change of contact person, address, or phone number that is contained in the application received <u>September 16, 1996</u>.

9. Upon presentation of credentials the Board or Department, or any duly authorized agent, shall have the power to enter, at reasonable times and under reasonable circumstances, any establishment or upon any property, public or private, located anywhere in the Commonwealth for the purposes of obtaining information, conducting surveys or inspections, or inspecting wells and springs to ensure compliance with any permits, special exceptions, standards, policies, rules, regulations, rulings and special orders which the Board or Department may adopt, issue or establish to carry out the provisions of the Ground Water Management Act of 1992 and the Ground Water Withdrawal Regulation.

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
5636 Southern Boulevard, Virginia Beach, Virginia 23462
(757) 518-2000 Fax (757) 518-2103
www.deq.virginia.gov

L. Preston Bryant, Jr
Secretary of Natural Resources

David K. Paylor
Director

Francis L. Daniel
Regional Director

December 6, 2007

Mr. John S. Hadfield, P.E.
Executive Director
Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, Virginia 23320

Location: Suffolk
Registration No.: 61341
AFS Id. No.: 51-800-00121

Dear Mr. Hadfield:

Attached is a renewal permit to operate the SPSA Regional Landfill; a municipal solid waste landfill pursuant to 9 VAC 5 Chapter 80 of the Virginia Regulations for the Control and Abatement of Air Pollution. This permit incorporates provisions from the New Source Review permit dated August 18, 1995, issued to U.S. Energy Biogas.

The permit contains legally enforceable conditions. Failure to comply may result in a Notice of Violation and civil penalty. Please read all permit conditions carefully.

In evaluating the application and arriving at a final decision to issue this permit, the Department deemed the application complete on July 20, 2007, and solicited written public comments by placing a newspaper advertisement in The Virginian Pilot on Sunday, October 21, 2007. The thirty day comment period (provided for in 9 VAC 5-80-270) expired on Tuesday, November 20, 2007, with no comments received.

This approval to operate does not relieve the Southeastern Public Service Authority of the responsibility to comply with all other local, state and federal permit regulations.

Issuance of this permit is a case decision. The Regulations, at 9 VAC 5-170-200, provide that you may request a formal hearing from this case decision by filing a petition with the Board within 30 days after this permit is mailed or delivered to you. Please consult that and other relevant provisions for additional requirements for such requests.

Additionally, as provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date you actually received this permit or the date on which it was mailed to you, whichever occurred first, within which to initiate an appeal to court by filing a Notice of Appeal with:

David K. Paylor, Director
Department of Environmental Quality
PO Box 1105
Richmond, VA 23218-1105

In the event that you receive this permit by mail, three days are added to the period in which to file an appeal. Please refer to Rule 2A of the Rules of the Supreme Court of Virginia for additional information including filing dates and the required content of the Notice of Appeal.

If you have any questions concerning this permit, please contact Mr. Stephen Hackney at (757) 518-2124.

Sincerely,

Jane A. Workman
Air Permit Manager

Attachments: Permit
Statement of Basis

cc: Director, OAPP (electronic file submission)
Manager, Data Analysis (electronic file submission)
Chief, Air Enforcement Branch (3AP12), U.S. EPA, Region III

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
5636 Southern Boulevard, Virginia Beach, Virginia 23462
(757) 518-2000 Fax (757) 518-2103
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L. Preston Bryant, Jr
Secretary of Natural Resources

David K. Paylor
Director

Francis L. Daniel
Regional Director

Federal Operating Permit
Article 1

This permit is based upon the requirements of Title V of the Federal Clean Air Act and Chapter 80, Article 1, of the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution. Until such time as this permit is reopened and revised, modified, revoked, terminated or expires, the permittee is authorized to operate in accordance with the terms and conditions contained herein. This permit is issued under the authority of Title 10.1, Chapter 13, §10.1-1322 of the Air Pollution Control Law of Virginia. This permit is issued consistent with the Administrative Process Act, and 9 VAC 5-80-50 through 9 VAC 5-80-300 of the State Air Pollution Control Board Regulations for the Control and Abatement of Air Pollution of the Commonwealth of Virginia.

Authorization to operate a Stationary Source of Air Pollution as described in this permit is hereby granted to:

Permittee Name:	Southeastern Public Service Authority
Co-Operator Name:	Suffolk Energy Partners, L.P.
Facility Name:	Suffolk Regional Landfill
Facility Location:	1 Bob Foeller Drive, City of Suffolk, Virginia
Registration Number:	61341
Permit Number:	TRO-61341

This permit includes the following programs:

Federally Enforceable Requirements – Clean Air Act (Sections I through VII)
State Only Enforceable Requirements – (Section VIII)

December 6, 2007
Effective Date

December 5, 2012
Expiration Date

Francis L. Daniel
Francis L. Daniel

December 6, 2007
Signature Date

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I. Facility Information

Permittee
Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, Virginia 23320

Responsible Official
Mr. John S. Hadfield, P.E.
Executive Director

Facility
SPSA Regional Landfill
1 Bob Foeller Drive
Suffolk, Virginia 23434

Contact Person
Ms. Amy Hardy
Environmental Compliance Coordinator
757-539-9373 ext.7

Co-Operator
Suffolk Energy Partners, L.P.
40 Tower Lane / 1st Floor
Avon, CT 06001

Contact Person
Jamie Margaritas
Facility Manager
757-538-2513 / cell 757-576-9576

Identification Number: 51-800-00121

Facility Description: SIC Code 4953, NAICS Code 562212 – The source is a municipal solid waste landfill with a tire shredder installation, leachate collection system, and a landfill gas collection and control system. An energy recovery plant operated by another company with the name; 'Suffolk Energy Partners, L.P.' operates combustion equipment, which includes four engines and a flare. Power Generation (Registration No. 61137) obtained a NSR permit dated August 18, 1995, for the operation of the combustion equipment.

II. Emission Units

Equipment to be operated consists of:

Emission Unit ID	Stack ID	Emission Unit Description	Size/Rated Capacity*	Pollution Control Device (PCD) Description	PCD ID	Pollutant Controlled	Applicable Permit Date
Fuel Burning Equipment							
FL-1	STK0	LFG Specialties Utility Flare	1500 scfm	no additional devices	FL-1	NMOCs	August 18, 1995
GEN-1	STK1	Caterpillar generator set, G3516, #4EK00178	325 scfm-LFG / 820KW	no additional devices	GEN-1	NMOCs	August 18, 1995
GEN-2	STK2	Caterpillar generator set, G3516, #4EK00179	325 scfm-LFG / 820KW	no additional devices	GEN-2	NMOCs	August 18, 1995
GEN-3	STK3	Caterpillar generator set, G3516, #4EK00177	325 scfm-LFG / 820KW	no additional devices	GEN-3	NMOCs	August 18, 1995
GEN-4	STK4	Caterpillar generator set, G3516, #4EK00175	325 scfm-LFG / 820KW	no additional devices	GEN-4	NMOCs	August 18, 1995
Process A							
LFO-1	1A	Landfill Operations	27,323,410 yd^3	Landfill Gas Collection and Control System	GCCS	NMOCs	None
Process B							
GCCS	1B	Gas Collection and Control System	4457 scfm	LFG burning equipment	GCCS	NMOCs	None
MAINT	1C	Vehicle and other facility equipment maintenance	N/A	None	--	VOC	None
08	N/A	Fugitive Dust	N/A	None	--	PM	None

*The Size/Rated capacity and PCD efficiency is provided for informational purposes only, and is not an applicable requirement.

III. Landfill Operations and Fuel Burning Equipment Requirements – (emission unit ID# FL-1, GEN-1, GEN-2, GEN-3 and GEN-4)

A. Limitations

1. **The GCCS System** – Prior to December 7, 2004, the permittee installed an active collection and control system, approved by the Administrator that captures the gas generated within the landfill. The GCCS installed at the Suffolk Regional Landfill has been certified under 40 CFR 60.752 (b)(2)(ii)(A). The active collection system shall be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment. The maximum expected collection rate for the term of this permit is 4457 cfm. The system shall collect gas from each cell in the landfill in which solid waste has been placed for a period of 5 years or more if active or 2 years or more if closed or at final grade. The system shall collect gas at a sufficient extraction rate to meet all operational requirements. Also, the system shall be designed to minimize the off-site migration of subsurface gas. Based on the SPSA report of June 6, 2002 describing the 2002 calculated NMOC rate of 66.99 Mg, SPSA was required to submit a design plan for the GCCS by June 6, 2003. The original GCCS design plan was received at DEQ on June 6, 2003 and an update for 2007; dated June 28, 2007 was received on July 6, 2007.
(9 VAC 5-80-110, 40 CFR 60.752 (b)(2)(ii)(A) and 40 CFR 60.753(a))

2. **NMOC Emission Controls** - The collection system shall route all collected gas to one or more of the following control devices where it is combusted: the candle flare, FL-1, the generators, GEN-1, GEN-2, GEN-3, GEN-4 and the off-site device, OS-1. During normal operations, all of the gas collected by the GCCS shall be routed to a control device and combusted. The candle flare, FL-1 shall be designed and operated in accordance with 40 CFR 60.18.
(9 VAC 5-80-110, 9 VAC 5-80-40, 40 CFR 60.752 (b)(2)(iii), 60.756(b)(1) and 60.753 (e))

3. **GCCS Operation** – The permittee shall operate the system such that negative pressure is maintained at each active wellhead except in case of fire or increased well temperature. Additionally, the permittee shall operate each interior, active wellhead in the collection system such that the gas temperature is less than 55 degrees C and with either nitrogen level less than 20% or an oxygen level less than 5%.
(9 VAC 5-80-110, 40 CFR 60.753(b) & (c))

4. **Control of Surface Methane** – The permittee shall operate the collection system such that the surface methane concentration is less than 500 ppm above the background level at the surface of the landfill. The permittee shall conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. Areas with steep slopes or other dangerous areas such as the working face of the landfill may be excluded after receiving approval from the Director, Tidewater Regional Office.
(9 VAC 5-80-110 and 40 CFR 60.753(d))

5. **Operating Parameters** – The provisions for oxygen (or nitrogen), temperature, pressure and surface methane concentrations shall apply at all times except during periods of start up, shut down, or malfunction, provided that the duration of start up, shut down, or malfunction does not exceed 5 days for collection systems and does not exceed 1 hour for treatment or control devices.
(9 VAC 5-80-110 and 40 CFR 60.755(e))

6. **GCCS Shut down** - The permittee shall operate the system such that all collected gas is routed to one or more control devices. In the event that the collection and control system malfunctions, the GCCS gas moving equipment shall be shut down and all vents to the atmosphere shall be closed within 1 hour.
(9 VAC 5-80-110 and 40 CFR 60.753(e))

7. **Placement of New Wells** – The permittee shall place each well or design component as specified in the GCCS design plan and shall install wells no later than 60 days after the date on which the initial solid waste has been in place in any cell or group of cells for a period of 5 years or more if active or 2 years or more if closed or at final grade.
(9 VAC 5-80-110 and 40 CFR 60.755(b))

8. **NSPS Subpart WWW** – The municipal solid waste landfill, as well as the GCCS shall be constructed and operated in accordance with 40 CFR 60 Subpart WWW. When 'The Administrator' is prescribed as the recipient of reports required by this Subpart, it shall be understood to be the Director, Tidewater Regional Office.
(9 VAC 5-80-110 and 40 CFR 60.750 through 40 CFR 60.759)

9. **Approved Fuels** - The approved fuel for the engines and flare is landfill gas. No makeup fuel is authorized in conjunction with the operation of the Gas Control and Collection System (GCCS). Any request to add a new fuel may require a permit modification.
(9 VAC 5-80-110 and Condition #4 of NSR permit issued August 18, 1995)

10. **Throughput Limit** - The four internal combustion engines (combined) shall consume no more than 656 million cubic feet of landfill gas per year at standard atmospheric conditions (68 °F and 14.7 psi), calculated monthly as the sum of each consecutive 12 month period.
(9 VAC 5-80-110 and Condition #5 of NSR permit issued August 18, 1995)

11. **Fugitive Dust Emissions** - Fugitive dust and fugitive emissions controls shall include the following, or equivalent, as a minimum:

    a. All cover material being stockpiled shall be kept adequately moist to control dust during storage and handling or covered at all times to minimize emissions as appropriate.

    b. Dust from haul roads and traffic areas shall be controlled by the application of asphalt, water, suitable chemicals or equivalent methods approved by the DEQ.

c. Reasonable precautions shall be taken to prevent deposition of dirt on public roads and subsequent dust emissions. These measures shall include paving the entrance road to the facility up to the vicinity of the process areas. Trucks leaving the site shall have clean wheels – achieved by use of a wheel washer or equivalent. Dirt, product or raw material spilled or tracked onto paved surfaces shall be promptly removed or wetted to prevent particulate matter from becoming airborne.

d. Effective speed controls for through traffic shall be implemented at the facility.
(9 VAC 5-80-110, 9 VAC 5-50-20 and 9 VAC 5-50-90)

12. Emissions from the operation of the landfill gas combustion devices, generators GEN-1, GEN-2, GEN-3 and GEN-4 (combined) shall not exceed the limits specified below:

Total Particulate	5.3 tons/yr
PM-10	5.3 tons/yr
Nitrogen Oxides (as NO_2)	63.0 tons/yr
Carbon Monoxide	82.3 tons/yr
Volatile Organic Compounds (as NMOC's)	29.8 tons/yr

Annual emissions are to be determined for each 12-month consecutive period.
(9 VAC 5-80-110 and Condition #8 of NSR permit issued August 18, 1995)

13. **Facility Wide Emission Limits** - Emissions from the operation of the landfill based on all expected emissions using data from Calendar Year 2001 emission estimates:

Total Particulate/PM-10	21.2 tons/yr
Sulfur Dioxide	7.9 tons/yr
Nitrogen Oxides (as NO_2)	103.8 tons/yr
Carbon Monoxide	283.7 tons/yr
Volatile Organic Compounds (as NMOC's)	29.8 tons/yr

Annual emissions are to be determined for each 12-month consecutive period.
(9 VAC 5-80-110 and 40 CFR 60.752(b)(2)(iii)(A)&(B))

14. **Visible Emissions Limit** - Visible Emissions from each internal combustion engine exhaust stack shall not exceed five (5) percent opacity, as determined by EPA Method 9 (reference 40 CFR 60, Appendix A). A visible emissions evaluation (VEE) shall be conducted on each engine exhaust stack. This condition applies at all times except during startup, shutdown and malfunction.
(9 VAC 5-50-80, 9 VAC 5-80-110 and Condition #9 of NSR permit issued August 18, 1995)

15. **Visible Emissions Limit** - The flare, when it is being utilized, shall be operated with no visible emissions as determined by EPA method 22 except for periods not to exceed a total of 5 minutes during 2 consecutive hours. This condition applies at all times except during startup, shutdown, and malfunction.
    (9 VAC 5-80-110 and 40 CFR 60.18)

16. **Combustion Emissions** - Combustion equipment emissions shall be controlled by proper operation and maintenance. Equipment operators shall be trained in the proper operation of all such equipment. Training shall consist of a review and familiarization of the manufacturer's operating instructions, at minimum.
    (9 VAC 5-80-110)

17. A copy of the August 18, 1995 permit shall be maintained on the premises of all facilities to which it applies.
    (9 VAC 5-80-110 and Condition #17 of NSR permit issued August 18, 1995)

18. **Startup, Shutdown and Malfunction Plan** – As an affected source, the SPSA Regional Landfill is categorized as a 'new/reconstructed landfill' in 40 CFR Part 63, Subpart AAAA. The additional requirements beyond those imposed in the NSPS include development of the 'SSM' plan and the start of semi-annual reporting for the GCCS system, beginning January 16, 2003.

    (9 VAC 5-80-110, 40 CFR 63.1930 through 63.1990)

B. Monitoring

1. **Well Pressure** - The permittee shall measure gauge pressure in the header at each individual active well monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within 5 calendar days. If a negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the system shall be expanded within 120 days of the initial measurement of positive pressure. Exceptions to this requirement are listed under 40 CFR 60.753 (b)(1)-(b)(3). If corrective actions are taken as specified in 60.755, the monitored exceedance is not a violation of the operational requirements.
   (9 VAC 5-80-110 and 40 CFR 60.755(a)(3))

2. **Well Parameters** - The permittee shall monitor each active well monthly for temperature and nitrogen or oxygen as specified in Condition III.A.3. If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance.
   (9 VAC 5-80-110 and 40 CFR 60.755(a)(5))

3. **Surface Methane** - The permittee shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that transverses the landfill at 30 meter intervals for each collection area for which waste has been in place for two or more years if closed or at final grade or for which waste has been in place for five or more years if active. This surface methane monitoring shall take place on a quarterly schedule and using an organic vapor analyzer, flame ionization detector or other portable monitor meeting the specifications provided in paragraph (d) of 40 CFR 60.755. Areas with steep slopes, the active working face or other dangerous areas may be excluded from this monitoring as approved by the Director, Tidewater Regional Office
(9 VAC 5-80-110 and 40 CFR 60.755(c)(1))

4. **Exceedances** – Any reading of surface methane of 500 ppm or more above background at any location shall be recorded as a monitored exceedance and the actions specified below shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements.

   a. The location of the exceedance shall be marked and recorded.

   b. The permittee shall perform cover maintenance or make adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of the exceedance. The location shall be remonitored within 10 calendar days of detecting the exceedance.

   c. If the remonitoring of the location shows a second exceedance, the permittee shall take additional corrective action and shall monitor the location again within 10 days of the second exceedance. If the remonitoring shows a third exceedance for the location, the permittee shall install a new well or other collection device within 120 calendar days after the initial exceedance.

   d. Any location that initially showed an exceedance but has methane concentration less than 500 ppm above background at the 10-day remonitoring shall be remonitored 1 month from the initial exceedance. If the 1 month remonitoring shows a concentration less than 500 ppm above background, no further monitoring of that location is required until the next quarterly monitoring. If the 1-month remonitoring shows an exceedance, the permittee shall repeat the requirements of either paragraph (c) or (e) of this condition.

   e. For any location where the monitored methane concentration equals or exceeds 500 ppm above background 3 times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes, or control devices, and a corresponding timeline for installation may be submitted to the Director, Tidewater Regional Office.

   (9 VAC 5-80-110 and 40 CFR 60.755(c)(4)(i) through 60.755 (c)(4)(v))

5. **Cover Integrity** - The permittee shall implement a program to monitor for cover integrity and accomplish cover repairs as necessary on a monthly basis.
(9 VAC 5-80-110 and 40 CFR 60.755(c)(4))

6. **Sampling Ports** - The permittee shall install a sampling port and a port for temperature measurements at each wellhead. The permittee shall measure the gauge pressure in the gas collection header on a monthly schedule. The permittee shall monitor nitrogen or oxygen concentration in the landfill gas on a monthly schedule. The permittee shall monitor temperature of the landfill gas on a monthly schedule.
(9 VAC 5-80-110 and 40 CFR 60.756(a))

7. **Monitoring Devices** - The GCCS shall be equipped with a gas flow rate-measuring device that shall record the flow to all the combustion equipment at least every 15 minutes. Individual gas volumes to the (1) Engines, (2) Flare, and (3) Offsite processes shall be recorded on a daily basis. The flare shall be equipped with a temperature-monitoring device equipped with a continuous recorder to ensure the proper operation of the flare on a continuing basis.

   Each monitoring device shall be installed, maintained, calibrated and operated in accordance with approved procedures which shall include, as a minimum, the manufacturer's written requirements or recommendations. Each monitoring device shall be provided with adequate access for inspection and shall be in operation when the GCCS is operating.
(9 VAC 5-80-110, 9 VAC 5-50-20 C, 40 CFR 60.756(b)(1) &(b)(2) and Condition #3 of NSR permit issued August 18, 1995)

8. **Periodic Monitoring** - The permittee or co-operator shall perform periodic visual evaluations of each engine once each calendar week, when operating, for compliance with the opacity standards for fuel burning equipment. If such periodic evaluations indicate any visible emissions, the permittee shall take appropriate action, immediately, to return the unit to normal operation such that no visible emissions exist. If such corrective action fails to correct the problem, the permittee or co-operator shall conduct a visible emissions evaluation (VEE) utilizing EPA Method 9 for six minutes. If the six minute VEE opacity average exceeds 5%, the VEE shall continue for an additional twelve minutes. If any of the six minute averages during the 18 minutes exceeds 10% opacity, the VEE shall continue for one hour from initiation, to determine compliance with the opacity limit. The permittee shall record the details of the visual emissions observations, VEE, and any corrective actions.
(9 VAC 5-80-110 E)

9. **Periodic Monitoring** - The permittee or co-operator shall perform periodic visual evaluations of the flare once each calendar week, when operating, for compliance with the opacity standards for fuel burning equipment. If such periodic evaluations indicate any visible emissions, the permittee shall take appropriate action, immediately, to return the unit to normal operation such that no visible emissions exist. If such corrective action fails to correct the problem, the permittee or co-operator shall conduct a visible emissions evaluation (VEE) utilizing EPA Method 22 (reference 40 CFR 60, Appendix A). If a method 22 evaluation and/or corrective action become necessary, the permittee or co-operator shall record the details of the incident in a logbook. The logbook shall be kept on site and available for inspection by the DEQ for the most recent five year period.
(9 VAC 5-80-110 E)

C. Recordkeeping

1. **Well Inspections** - The permittee shall record and maintain a log of well inspections that indicates a positive pressure had existed and the corrective action taken to alleviate the abnormal condition at the wellhead. Exceptions to this requirement include; a fire or increased well temperature, use of a geomembrane or synthetic cover, or a decommissioned well.
(9 VAC 5-80-110 and 40 CFR 60.753 (b)(1) – 753 (b)(3))

2. **Surface Monitoring Plan** – The permittee shall develop and maintain a surface monitoring design plan that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30 meter intervals.
(9 VAC 5-80-110 and 40 CFR 60.753(d))

3. **Design Capacity** – The permittee shall keep for at least 5 years, current, readily accessible, on site records of the design capacity report, based on the original report, dated May 1, 1996; the current amount of waste in place; and the annual placement rates for solid waste. Off site records may be maintained if they are retrievable within 4 hours. Either paper copy or electronic formats, approved by DEQ, are acceptable.
(9 VAC 5-80-110 and 40 CFR 60.758(a))

4. **On Site Records** - The permittee shall maintain records of emission data and operating parameters as necessary to demonstrate compliance with this permit and 40 CFR 60.758. The content and format of such records shall be arranged with the Director, Tidewater Regional Office. These records shall include, but are not limited to:

    a. Annual throughput of landfill gas to (1) Engines, (2) Flare, and (3) Offsite processes, calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months. (40 CFR 60.758 (b)(1) & (b)(4))

b. The total annual throughput of landfill gas, calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months. (40 CFR 60.758 (b)(1))

c. Annual placement of MSW in the landfill, calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months. (40 CFR 60.758 (a))

d. All GCCS and engine/flare system monitoring information, including observations of opacity as noted under the Monitoring Requirements, above.

e. All visual emissions observations and evaluations for the engines and flare, including the date and time of the observations, whether or not visible emissions were noted, the results of any Method 9 or Method 22 VEE's and any corrective action taken.

f. The content and format of any such additional records shall be arranged with the Tidewater Regional Office. All records required by this condition and Subpart WWW (40 CFR 60.758) shall be available for inspection by the DEQ and shall be current for the most recent five years.

(9 VAC 5-50-410, 9 VAC 5-80-110 and 40 CFR 60.758)

5. **Operating Parameters** – The permittee shall maintain for 5 years, readily accessible records of the following monitoring observations:

   a. Wellhead gauge pressures measured monthly.

   b. Wellhead temperatures measured monthly.

   c. Wellhead nitrogen or oxygen concentrations measured monthly.

   d. Flow rate of the landfill gas to the control system.

   e. Results of quarterly surface methane monitoring.

   f. Malfunction reports for control or collection devices.

   (9 VAC 5-80-110 and 40 CFR 60.753 (c) & (d) and 40 CFR 60.758(c))

6. **Collection System** - The permittee shall keep for the life of the collection system an up to date, readily accessible plot map showing each existing and planned collector in the system. This map shall also provide a unique identification location label for each collector. Additionally, each owner or operator shall keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors specified under 40 CFR 60.755(b).
   (9 VAC 5-80-110 and 40 CFR 60.758(d))

7. **Collection System** – The permittee shall maintain for 5 years, readily accessible records of all collection and control system exceedances of the operational standards, including the readings taken in later months showing a return to compliance, and the location where the exceedance occurred.
   (9 VAC 5-80-110 and 40 CFR 60.758(e))

8. **Malfunction** – The permittee shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of the landfill gas collection and control system, any malfunction of the air pollution control equipment or any periods during which a continuous monitoring system or monitoring device is inoperative for more than one hour.
   (9 VAC 5-80-110 and 40 CFR 60.758(c)(1))

9. **Compliance** – All records, reports and measurements required to show compliance with Subpart WWW shall be prepared and submitted to the Director, Tidewater Regional Office as listed in 40 CFR 60.755.
   (9 VAC 5-80-110, 9 VAC 5-50-50 and 40 CFR 60.755)

10. **Training Records** - The permittee or co-operator shall maintain records of the required training including a statement of time, place and nature of training provided. The permittee or co-operator shall have available good written operating procedures and a maintenance schedule for the combustion equipment.. These procedures shall be based on the manufacturer's recommendations, at minimum. All records required by this condition shall be kept at the facility and made available for inspection by the DEQ.
    (9 VAC 5-80-110)

D. Testing

1. **Emissions Testing** – The permitted facility shall be constructed so as to allow for emissions testing and monitoring upon reasonable notice at any time, using appropriate methods. Test ports will be provided, as necessary, in order to facilitate testing at the appropriate locations.
   (9 VAC 5-50-30 and Condition #6 of August 18, 1995 permit)

2. **Nitrogen Testing** – If measured, the nitrogen level at each wellhead shall be determined by using Method 3C.
   (9 VAC 5-80-110 and 40 CFR 60.753(c)(1))

3. **Oxygen Testing** – The oxygen level at each wellhead shall be determined by an oxygen meter using Method 3A, except for the following:

   a. The span shall be set so that the regulatory limit is between 20 and 50 percent of the span.

   b. A data recorder is not required.

   c. Only a zero and a span calibration gas are required. Ambient air may be used as the span.

   d. A calibration error check is not required.

e. The allowable sample bias, zero drift, and calibration drift are +/- 10%.
(9 VAC 5-80-110 and 40 CFR 60.753 (c)(2))

4. **Surface Monitoring** – The background concentration of methane during surface emissions monitoring shall be determined for the instrument measuring the surface concentrations of methane by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells. Surface emission monitoring shall be performed in accordance with 40 CFR 60 Appendix A, Method 21, Section 4.3.1, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions.
(9 VAC 5-80-110 and 40 CFR 60.755(b)(3))

5. **Surface Monitoring Method of Operation** – The portable analyzer used to determine the surface methane concentration shall meet the instrument specifications provided in 40 CFR 60, Appendix A, Method 21, Section 3, except that methane shall replace all references to VOC. The calibration gas shall be methane, diluted to a nominal concentration of 500 ppm in air. To meet the performance evaluation requirements in section 3.1.3 of Method 21, the instrument evaluation procedures of Section 4.4 of Method 21 shall be used. The calibration procedures in Section 4.2 of Method 21 shall be followed immediately before commencing a surface monitoring survey.
(9 VAC 5-80-110 and 40 CFR 60.755(d))

6. **Exit Velocity** – Concurrently with the visible emissions performance tests on the open flare designated FL-1, the actual exit velocity of the open flare shall be determined by Reference Methods 2, 2A, 2C or 2D as appropriate; by the unobstructed (free) cross sectional area of flare tip.
(9 VAC 5-50-410 and 40 CFR 60.18(f)(3))

7. **Initial Performance Testing** – The NSPS, Subpart WWW provides for alternate procedures other than the initial performance test, when adequate treatment of the landfill gas is performed on site. The recognized treatment scenario includes the dewatering of the gas, filtering with a 10-micron screen and the compression of the gas prior to a combustion device. Combustion devices on site include a candle flare, FL-1, the engines, GEN-1, GEN-2, GEN-3 and GEN-4. SPSA and Suffolk Energy Partners, L.P. have indicated that the landfill gas will be treated on-site with dewatering by passing through three knockouts, filtering through two 10 micron screens, cooling in an air-to-air cooler, and compressing to 8 psig in a 300 horsepower blower before being transmitted to the engines and flare. 40 CFR 60.752(b) (2) (iii) (C) does not include an initial performance test for the landfill gas treatment control option. Therefore, any landfill gas energy recovery device, utilizing landfill gas from the facility, which has met the treatment standards included in this condition, will not require an initial performance test of the control equipment
(9 VAC 5-50-30, 9 VAC 5-80-10 J, 40 CFR 60.752(b)(2)(iii)(C))

8. If testing is conducted in addition to the monitoring specified in this permit, the permittee shall use the appropriate methods in accordance with procedures approved by the DEQ. (9 VAC 5-80-110)

E. Reporting

1. On March 1st and September 1st of each year, routine reports required by the Landfill MACT and the NSPS for the operation of the GCCS shall be submitted to the DEQ. The Table, below outlines all reports required by the NSPS and Landfill MACT.

Report Name	**Periods Covered**	**Report Due Dates**	**Ref. Condition Nos.**	**Regulation Citations**
NSPS and MACT Compliance	Jan, 1st to Jun. 30th Jul. 1st to Dec. 31st	March 1st & Sept. 1st The annual report is now semi-annual.	III.A.9, III.A. 19, III.C.9	40 CFR 60.753 to 60.757 & 63.1980 (a)
Landfill MACT, SSM Report	Jan, 1st to Jun. 30th Jul. 1st to Dec. 31st	March 1st & Sept. 1st	III.A.19, III.E.1	40 CFR 63.1980
Gas Collection and Control System Design Plan	None specified	As required by GCCS construction activity	III.A.1	40 CFR 60.752 (b)(2)(ii)(A) and 40 CFR 755
Semi-annual Monitoring	Jan, 1st to Jun. 30th Jul. 1st to Dec. 31st	March 1st & Sept. 1st	VII.C.3	9 VAC 5-80-110

2. **Important Report Details**

   a. Instances when positive pressure at a wellhead occurred due to efforts to avoid a fire. If no such instances occur, the permittee shall submit a negative report.

   b. Values and time periods for exceedances of pressure, temperature, nitrogen or oxygen measurements at wellheads. Exceptions exist for pressure where a geomembrane or synthetic cover is used and for decommissioned wells.

   c. Any periods of control equipment malfunction or diversion of the landfill gas stream exceeding one hour, including dates and the duration of the control equipment outage.

   d. All instances when the GCCS was not operating for more than five consecutive days.

   e. All instances where surface methane concentration exceeded 500 ppm; the actual concentration recorded and the location on the plot plan of that exceedance.

   f. Records of GCCS expansion, including dates, locations and equipment installed in the process of expanding the GCCS.

   g. Startup, shutdown and malfunction (SSM) plan activity reports.

   (9 VAC 5-50-410, 40 CFR 60.757 (f), 40 CFR 60.753 (b)(1) and 40 CFR 63.1980)

3. The permittee shall submit written notification to the Director, Tidewater Regional Office of the anticipated dates of performance tests, postmarked at least 30 days prior to the date of the tests. Copies of these written notifications shall be sent to:

Chief, Air Enforcement Branch (3AT20)
U.S. Environmental Protection Agency
Region III, 1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

(9 VAC 5-50-410 and 40 CFR 60.7 (a))

F. Requirements for Landfill Closure

1. The GCCS may be capped or removed provided that all of the following conditions are met:

   a. The landfill shall be a closed landfill. A closed landfill is defined as a landfill in which solid waste is no longer being placed and in which no additional solid wastes will be placed without first filing a notification of modification as prescribed in the General Provisions of 40 CFR 60. A closure report shall be submitted to the DEQ as provided in 40 CFR 60.757(d).

   b. The GCCS shall have been operating for at least 15 years from installation.

   c. The calculated NMOC gas production shall be less than 50 megagrams per year on three successive test dates. The test dates shall be no less than 90 days apart and no more than 180 days apart.

   (9 VAC 5-50-410, 40 CFR 60.752(b)(2)(v) and 40 CFR 60.757(d))

2. The permittee shall calculate the NMOC emission rate for purposes of determining when the system can be removed using the following equation:

$$\mathbf{M_{NMOC} = 1.89 \times 10^{-3}\, Q_{LFG} \times C_{NMOC}}$$

where:

M_{NMOC} = mass emission rate of NMOC, Megagrams per year
Q_{LFG} = flow rate of landfill gas, cubic meters per minute
C_{NMOC} = NMOC concentration, ppmv as hexane

   a. Q_{LFG} shall be determined by measuring the total landfill gas flow rate at the common header pipe to the control device using a gas flow measuring device calibrated according to the provisions of 40 CFR 60, Appendix A, Method 2E, Section 4 or other methods approved by the Administrator.

   b. C_{NMOC} = shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18. If using Method 18, the minimum list of compounds to be tested shall be those published in the most recent version of AP-42. The sample location on the common header shall be located upstream of any condensate removal or other refining units. The permittee shall divide the NMOC concentration (as methane) from Method 25C by six to obtain the NMOC concentration as hexane.

   (9 VAC 5-50-410 and 40 CFR 60.754(b))

3. The permittee shall submit a closure report to DEQ and the Administrator within 30 days of waste acceptance cessation. DEQ may request additional information as may be necessary to verify that permanent closure has taken place in accordance with the requirements of 9 VAC 20-80-250 E. and F and 40 CFR 258.60. If a closure report has been submitted to the DEQ, no additional wastes may be placed into the landfill without filing a notification of modification. (9 VAC 5-50-410 and 40 CFR 60.757(d))

4. The permittee shall submit an equipment removal report to the DEQ 30 days prior to removal or cessation of operation of the control equipment. The report shall contain the following:

   a. A copy of the closure report.

   b. A copy of the GCCS startup report demonstrating that the 15 year minimum control period has expired.

   c. Dated copies of 3 successive NMOC emission rate reports demonstrating the landfill is no longer producing 50 Mg or greater of NMOC per year.

   d. DEQ may request additional information to verify that all conditions for removal have been met.

   (9 VAC 5-50-410 and 40 CFR 60.757(e))

IV. Facility Wide Conditions

A. Limitations

1. The opacity standard (visible emission standard) shall apply at all times except during periods of startup, shutdown and malfunction.
(9 VAC 5-50-20 A and 9 VAC 5-80-110)

2. At all times, including periods of startup, shutdown and malfunction, owners shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with air pollution control practices for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Virginia Department of Environmental Quality, which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspections of the source.
(9 VAC 5-50-20 E, 9 VAC 5-50-380, 9 VAC 5-20-180 A and 9 VAC 5-80-110)

3. In case of shutdown or bypassing, or both, of air pollution control equipment for necessary scheduled maintenance which results in excess emissions for more than one hour, the intent to shut down such equipment shall be reported to the board and local air pollution control agency, if any, at least 24 hours prior to the planned shutdown. Such prior notice shall include, but is not limited to, the following:

a. Identification of the specific facility to be taken out of service as well as its location and permit or registration number;

b. The expected length of time that the air pollution control equipment will be out of service;

c. The nature and quantity of emissions of air pollutants likely to occur during the shutdown period; and,

d. Measures that will be taken to minimize the length of the shutdown or to negate the effect of the outage of the air pollution control equipment.

(9 VAC 5-50-380, 9 VAC 5-20-180 and 9 VAC 5-80-110)

4. In the event that any affected facility or related air pollution equipment fails or malfunctions in such a manner that may cause excess emissions for more than one hour, the owner shall, as soon as is practicable but no later than four daytime business hours, notify the board by facsimile transmission, telephone or telegraph of such failure or malfunction and shall within two weeks provide a written statement giving all pertinent facts, including the estimated duration of the breakdown. When the condition causing the failure or malfunction has been corrected and the equipment is again in operation, the owner shall notify the board. (9 VAC 5-50-380, 9 VAC 5-20-180 C and 9 VAC 5-80-110)

V. Insignificant Emission Units

The following emission units at the facility are identified in the application as insignificant emission units under 9 VAC 5-80-720:

Emission Unit No.	Emission Unit Description	Citation	Pollutant(s) Emitted (9 VAC 5-80-720 B)	Rated Capacity (9 VAC 5-80-720 C)
03	Ferrous Metals Recovery	5-80-720 B	PM	N/A
04	Tire Shredding	5-80-720 B	PM	N/A
05	Leachate Lagoon	5-80-720 B	VOC	N/A
06	Diesel storage tank	5-80-720 C	VOC	10,000 gallons
07	Diesel storage tank	5-80-720 C	VOC	10,000 gallons
08	Hydraulic oil tank	5-80-720 C	VOC	3000 gallons
09	Motor oil tank	5-80-720 C	VOC	2500 gallons
10	Waste oil tank	5-80-720 C	VOC	2000 gallons
11	Diesel water tank	5-80-720 C	POC's	100 HP

These emission units are presumed to be in compliance with all requirements of the federal Clean Air Act as may apply. Based on this presumption, no monitoring, recordkeeping, or reporting shall be required for these emission units in accordance with 9 VAC 5-80-110.

VI. Permit Shield & Inapplicable Requirements

Compliance with the provisions of this permit shall be deemed compliance with all applicable requirements in effect as of the permit issuance date as identified in this permit. This permit shield covers only those applicable requirements covered by terms and conditions in this permit and the following requirements which have been specifically identified as being not applicable to this permitted facility:

Citation	Title of Citation	Description of Applicability
40 CFR 60, Subpart Cc	Emission Guidelines for Control of Existing Sources: Municipal Solid Waste Landfills	This subpart is not applicable to the landfill because of recent modifications to the facility.
40 CFR 60, Subpart WWW	Landfill New Source Performance Standard	Engines combusting 'treated' landfill gas are not subject to the NSPS testing, monitoring, recordkeeping and reporting requirements.
40 CFR 63, Subpart AAAA	Landfill MACT	Recordkeeping and reporting requirements of the Landfill MACT do not apply to fuel burning units that combust 'treated' landfill gas.
40 CFR 63, Subpart ZZZZ	RICE MACT	The RICE MACT only applies to engines that are co-located at a major HAP source. The SPSA Regional Landfill is not major for HAP's.

Nothing in this permit shield shall alter the provisions of §303 of the federal Clean Air Act, including the authority of the administrator under that section, the liability of the owner for any violation of applicable requirements prior to or at the time of permit issuance, or the ability to obtain information by the administrator pursuant to §114 of the federal Clean Air Act, (ii) the Board pursuant to §10.1-1314 or §10.1-1315 of the Virginia Air Pollution Control Law or (iii) the Department pursuant to §10.1-1307.3 of the Virginia Air Pollution Control Law.
(9 VAC 5-80-140)

VII. General Conditions

A. Federal Enforceability

All terms and conditions in this permit are enforceable by the administrator and citizens under the federal Clean Air Act, except those that have been designated as only state-enforceable.
(9 VAC 5-80-110 N)

B. Permit Expiration

This permit has a fixed term of five years. The expiration date shall be the date five years from the date of issuance. Unless the owner submits a timely and complete application for renewal to the Department consistent with the requirements of 9 VAC 5-80-80, the right of the facility to operate shall be terminated upon permit expiration.

1. The owner shall submit an application for renewal at least six months but no earlier than eighteen months prior to the date of permit expiration.

2. If an applicant submits a timely and complete application for an initial permit or renewal under this section, the failure of the source to have a permit or the operation of the source without a permit shall not be a violation of Article 1, Part II of 9 VAC 5 Chapter 80, until the Board takes final action on the application under 9 VAC 5-80-150.

3. No source shall operate after the time that it is required to submit a timely and complete application under subsections C and D of 9 VAC 5-80-80 for a renewal permit, except in compliance with a permit issued under Article 1, Part II of 9 VAC 5 Chapter 80.

4. If an applicant submits a timely and complete application under section 9 VAC 5-80-80 for a permit renewal, but the Board fails to issue or deny the renewal permit before the end of the term of the previous permit, (i) the previous permit shall not expire until the renewal permit has been issued or denied, and (ii) all the terms and conditions of the previous permit, including any permit shield granted pursuant to 9 VAC 5-80-140, shall remain in effect from the date the application is determined to be complete until the renewal permit is issued or denied.

5. The protection under subsections F 1 and F 5 (ii) of section 9 VAC 5-80-80 F shall cease to apply if, subsequent to the completeness determination made pursuant to section 9 VAC 5-80-80 D, the applicant fails to submit, by the deadline specified in writing by the Board, any additional information identified as being needed to process the application.
   (9 VAC 5-80-80 B, C and F, 9 VAC 5-80-110 D and 9 VAC 5-80-170 B)

C. Recordkeeping and Reporting

1. All records of monitoring information maintained to demonstrate compliance with the terms and conditions of this permit shall contain, where applicable, the following:
   a. The date, place as defined in the permit, and time of sampling or measurements.
   b. The date(s) analyses were performed.
   c. The company or entity that performed the analyses.
   d. The analytical techniques or methods used.
   e. The results of such analyses.
   f. The operating conditions existing at the time of sampling or measurement.

   (9 VAC 5-80-110 F)

2. Records of all monitoring data and support information shall be retained for at least 5 years from the date of the monitoring sample, measurement, report, or application. Support information includes all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation, and copies of all reports required by the permit.
   (9 VAC 5-80-110 F)

3. The permittee shall submit the results of monitoring contained in any applicable requirement to DEQ no later than **March 1** and **September 1** of each calendar year. This report must be signed by a responsible official, consistent with 9 VAC 5-80-80 G, and shall include:
   a. The time period included in the report. The time periods to be addressed are January 1 to June 30 and July 1 to December 31.
   b. All deviations from permit requirements. For purposes of this permit, deviations include, but are not limited to:
      (1) Exceedance of emissions limitations or operational restrictions;
      (2) Excursions from control device operating parameter requirements, as documented by continuous emission monitoring, periodic monitoring, or compliance assurance monitoring which indicates an exceedance of emission limitations or operational restrictions; or,
      (3) Failure to meet monitoring, recordkeeping, or reporting requirements contained in this permit.
   c. If there were no deviations from permit conditions during the time period, the permittee shall include a statement in the report that "no deviations from permit requirements occurred during this semi-annual reporting period."

   (9 VAC 5-80-110 F)

D. Annual Compliance Certification

Exclusive of any reporting required to assure compliance with the terms and conditions of this permit or as part of a schedule of compliance contained in this permit, the permittee shall submit to EPA and DEQ no later than March 1 each calendar year a certification of compliance with all terms and conditions of this permit including emission limitation standards or work practices. The compliance certification shall comply with such additional requirements that may be specified pursuant to §114(a)(3) and §504(b) of the federal Clean Air Act. This certification shall be signed by a responsible official, consistent with 9 VAC 5-80-80 G, and shall include:

1. The time period included in the certification. The time period to be addressed is January 1 to December 31.
2. The identification of each term or condition of the permit that is the basis of the certification.
3. The compliance status.
4. Whether compliance was continuous or intermittent, and if not continuous, documentation of each incident of non-compliance.
5. Consistent with subsection 9 VAC 5-80-110 E, the method or methods used for determining the compliance status of the source at the time of certification and over the reporting period.
6. Such other facts as the permit may require to determine the compliance status of the source.

One copy of the annual compliance certification shall be sent to EPA at the following address:

Clean Air Act Title V Compliance Certification (3AP00)
U. S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029.

(9 VAC 5-80-110 K.5)

E. Permit Deviation Reporting

The permittee shall notify the Director, Tidewater Regional Office, within 4 daytime business hours of any deviations from permit requirements which may cause excess emissions for more than one hour, including those attributable to upset conditions as may be defined in this permit. In addition, within 14 days of the occurrence, the permittee shall provide a written statement explaining the problem, any corrective actions or preventative measures taken, and the estimated duration of the permit deviation. The occurrence should also be reported in the next semi-annual compliance monitoring report pursuant to General Condition VII.C.3. of this permit.
(9 VAC 5-80-110 F.2 and 9 VAC 5-80-250)

F. Failure/Malfunction Reporting

In the event that any affected facility or related air pollution control equipment fails or malfunctions in such a manner that may cause excess emissions for more than one hour, the owner shall, as soon as practicable but no later than four daytime business hours after the malfunction is discovered, notify the Director, Tidewater Regional Office by facsimile transmission, telephone or electronic mail of such failure or malfunction, and shall within 14 days of discovery provide a written statement giving all pertinent facts, including the estimated duration of the breakdown. Owners subject to the requirements of 9 VAC 5-40-50 C and 9 VAC 5-50-50 C are not required to provide the written statement prescribed in this paragraph for facilities subject to the monitoring requirements of 9 VAC 5-40-40 and 9 VAC 5-50-40. When the condition causing the failure or malfunction has been corrected and the equipment is again in operation, the owner or operator shall notify the Director, Tidewater Regional Office.

(9 VAC 5-20-180 C)

G. Severability

The terms of this permit are severable. If any condition, requirement or portion of the permit is held invalid or inapplicable under any circumstance, such invalidity or inapplicability shall not affect or impair the remaining conditions, requirements, or portions of the permit.

(9 VAC 5-80-110 G.1)

H. Duty to Comply

The permittee shall comply with all terms and conditions of this permit. Any permit noncompliance constitutes a violation of the federal Clean Air Act or the Virginia Air Pollution Control Law or both and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or, for denial of a permit renewal application.

(9 VAC 5-80-110 G.2)

I. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
(9 VAC 5-80-110 G.3)

J. Permit Modification

A physical change in or change in the method of operation of, this stationary source may be subject to permitting under State Regulations 9 VAC 5-80-50, 9 VAC 5-80-1100, 9 VAC 5-80-1605, or 9 VAC 5-80-2000 and may require a permit modification and/or revisions except as may be authorized in any approved alternative operating scenarios.
(9 VAC 5-80-190 and 9 VAC 5-80-260)

K. Property Rights

The permit does not convey any property rights of any sort, or any exclusive privilege.
(9 VAC 5-80-110 G.5)

L. Duty to Submit Information

1. The permittee shall furnish to the Board, within a reasonable time, any information that the Board may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Board copies of records required to be kept by the permit and, for information claimed to be confidential, the permittee shall furnish such records to the Board along with a claim of confidentiality.
(9 VAC 5-80-110 G.6)

2. Any document (including reports) required in a permit condition to be submitted to the Board shall contain a certification by a responsible official that meets the requirements of 9 VAC 5-80-80 G.
(9 VAC 5-80-110 K.1)

M. Duty to Pay Permit Fees

The owner and co-operator of any source for which a permit under 9 VAC 5-80-50 through 9 VAC 5-80-300 was issued shall pay permit fees consistent with the requirements of 9 VAC 5-80-310 through 9 VAC 5-80-350. The actual emissions covered by the permit program fees for the preceding year shall be calculated by the owner and submitted to the Department by April 15 of each year. The calculations and final amount of emissions are subject to verification and final determination by the Department.
(9 VAC 5-80-110 H and 9 VAC 5-80-340 C)

N. Fugitive Dust Emission Standards

During the operation of a stationary source or any other building, structure, facility, or installation, no owner or other person shall cause or permit any materials or property to be handled, transported, stored, used, constructed, altered, repaired, or demolished without taking reasonable precautions to prevent particulate matter from becoming airborne. Such reasonable precautions may include, but are not limited to, the following:

1. Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land;

2. Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which may create airborne dust; the paving of roadways and the maintaining of them in a clean condition;

3. Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty material. Adequate containment methods shall be employed during sandblasting or other similar operations;

4. Open equipment for conveying or transporting material likely to create objectionable air pollution when airborne shall be covered or treated in an equally effective manner at all times when in motion; and,

5. The prompt removal of spilled or tracked dirt or other materials from paved streets and of dried sediments resulting from soil erosion.

6. Post speed limit signs and enforce truck and other vehicle speed limits on site.

(9 VAC 5-40-90 and 9 VAC 5-50-90)

O. Startup, Shutdown, and Malfunction

At all times, including periods of startup, shutdown, soot blowing, and malfunction, owners shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with air pollution control practices for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Board, which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.
(9 VAC 5-50-20 E)

P. Alternative Operating Scenarios

Contemporaneously with making a change between reasonably anticipated operating scenarios identified in this permit, the permittee shall record in a log at the permitted facility a record of the scenario under which it is operating. The permit shield described in 9 VAC 5-80-140 shall extend to all terms and conditions under each such operating scenario. The terms and conditions of each such alternative scenario shall meet all applicable requirements including the requirements of 9 VAC 5 Chapter 80, Article 1.
(9 VAC 5-80-110 J)

Q. Inspection and Entry Requirements

The permittee or co-operator shall allow DEQ, upon presentation of credentials and other documents as may be required by law, to perform the following:

1. Enter upon the premises where the source is located or emissions-related activity is conducted, or where records must be kept under the terms and conditions of the permit.
2. Have access to and copy, at reasonable times, any records that must be kept under the terms and conditions of the permit.
3. Inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit.
4. Sample or monitor at reasonable times, substances or parameters for the purpose of assuring compliance with the permit or applicable requirements.

(9 VAC 5-80-110 K.2)

R. Reopening For Cause

The permit shall be reopened by the Board if additional federal requirements become applicable to a major source with a remaining permit term of three years or more. Such reopening shall be completed no later than 18 months after promulgation of the applicable requirement. No such reopening is required if the effective date of the requirement is later than the date on which the permit is due to expire, unless the original permit or any of its terms and conditions has been extended pursuant to 9 VAC 5-80-80 F.

1. The permit shall be reopened if the Board or the administrator determines that the permit contains a material mistake or that inaccurate statements were made in establishing the emissions standards or other terms or conditions of the permit.
2. The permit shall be reopened if the administrator or the Board determines that the permit must be revised or revoked to assure compliance with the applicable requirements.
3. The permit shall not be reopened by the Board if additional applicable state requirements become applicable to a major source prior to the expiration date established under 9 VAC 5-80-110 D.

(9 VAC 5-80-110 L)

S. Permit Availability

Within five days after receipt of the issued permit, the permittee shall maintain the permit on the premises for which the permit has been issued and shall make the permit immediately available to DEQ upon request.
(9 VAC 5-80-150 E)

T. Transfer of Permits

1. No person shall transfer a permit from one location to another, unless authorized under 9 VAC 5-80-130, or from one piece of equipment to another.
(9 VAC 5-80-160)

2. In the case of a transfer of ownership of a stationary source, the new owner shall comply with any current permit issued to the previous owner. The new owner shall notify the Board of the change in ownership within 30 days of the transfer and shall comply with the requirements of 9 VAC 5-80-200.
   (9 VAC 5-80-160)

3. In the case of a name change of a stationary source, the owner shall comply with any current permit issued under the previous source name. The owner shall notify the Board of the change in source name within 30 days of the name change and shall comply with the requirements of 9 VAC 5-80-200.
   (9 VAC 5-80-160)

U. Malfunction as an Affirmative Defense

1. A malfunction constitutes an affirmative defense to an action brought for noncompliance with technology-based emission limitations if the conditions of paragraph 2 of this condition are met.

2. The affirmative defense of malfunction shall be demonstrated by the permittee through properly signed, contemporaneous operating logs, or other relevant evidence that show the following:

   a. A malfunction occurred and the permittee can identify the cause or causes of the malfunction.

   b. The permitted facility was at the time being properly operated.

   c. During the period of malfunction, the permittee took all reasonable steps to minimize levels of emissions that exceeded the emissions standards or other requirements in the permit.

   d. The permittee notified the board of the malfunction within two working days following the time when the emissions limitations were exceeded due to the malfunction. This notification shall include a description of the malfunction, any steps taken to mitigate emissions, and corrective actions taken. The notification may be delivered either orally or in writing. The notification may be delivered by electronic mail, facsimile transmission, telephone, or any other method that allows the permittee to comply with the deadline. The notification fulfills the requirement of 9 VAC 5-80-110 F.2. b to report promptly deviations from permit requirements. This notification does not release the permittee from the malfunction reporting requirement under 9 VAC 5-20-180 C.

3. In any enforcement proceeding, the permittee seeking to establish the occurrence of a malfunction shall have the burden of proof.

4. The provisions of this section are in addition to any malfunction, emergency or upset provision contained in any requirement applicable to the source.

(9 VAC 5-80-250)

V. Permit Revocation or Termination for Cause

A permit may be revoked or terminated prior to its expiration date if the owner knowingly makes material misstatements in the permit application or any amendments thereto or if the permittee violates, fails, neglects or refuses to comply with the terms or conditions of the permit, any applicable requirements, or the applicable provisions of 9 VAC 5 Chapter 80 Article 1. The Board may suspend, under such conditions and for such period of time as the Board may prescribe, any permit for any of the grounds for revocation or termination or for any other violations of these regulations.
(9 VAC 5-80-190 C and 9 VAC 5-80-260)

W. Duty to Supplement or Correct Application

Any applicant who fails to submit any relevant facts or who has submitted incorrect information in a permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrections. An applicant shall also provide additional information as necessary to address any requirements that become applicable to the source after the date a complete application was filed but prior to release of a draft permit.
(9 VAC 5-80-80 E)

X. Stratospheric Ozone Protection

If the permittee handles or emits one or more Class I or II substances subject to a standard promulgated under or established by Title VI (Stratospheric Ozone Protection) of the federal Clean Air Act, the permittee shall comply with all applicable sections of 40 CFR Part 82, Subparts A to F.
(40 CFR Part 82, Subparts A-F)

Y. Accidental Release Prevention

If the permittee has more, or will have more than a threshold quantity of a regulated substance in a process, as determined by 40 CFR 68.115, the permittee shall comply with the requirements of 40 CFR Part 68.
(40 CFR Part 68)

Z. Changes to Permits for Emissions Trading

No permit revision shall be required under any federally approved economic incentives, marketable permits, emissions trading and other similar programs or processes for changes that are provided for in this permit.
(9 VAC 5-80-110 I)

AA. Emissions Trading

Where the trading of emissions increases and decreases within the permitted facility is to occur within the context of this permit and to the extent that the regulations provide for trading such increases and decreases without a case-by-case approval of each emissions trade:

1. All terms and conditions required under 9 VAC 5-80-110, except subsection N, shall be included to determine compliance.

2. The permit shield described in 9 VAC 5-80-140 shall extend to all terms and conditions that allow such increases and decreases in emissions.
3. The owner shall meet all applicable requirements including the requirements of 9 VAC 5-80-50 through 9 VAC 5-80-300.

(9 VAC 5-80-110 I)

VIII. State-Only Enforceable Requirements

The following terms and conditions are not required under the federal Clean Air Act or under any of its applicable federal requirements, and are not subject to the requirements of 9 VAC 5-80-290 concerning review of proposed permits by EPA and draft permits by affected states.

1. 9 VAC 5 Chapter 50, Part II, Article 2: Standards of Performance for Odorous Emissions.
2. 9 VAC Chapter 50, Part II, Article 3: Standards of Performance for Toxic Pollutants.

(9 VAC 5-80-110 N and 9 VAC 5-80-300

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L. Preston Bryant, Jr.
Secretary of Natural Resources

Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street
Richmond, Virginia 23219-2010
(804) 786-6124

December 13, 2007

John Hadfield, P.E.
Executive Director
Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Re: Notification of Virginia Soil and Water Conservation Board Decision
Virginia Stormwater Management Program (VSMP) Permit Regulations
MS4 Registration Number VAR040012

Dear Mr. Hadfield:

The Virginia Soil and Water Conservation Board ruled that the Southeastern Public Service Authority does not need to continue permit coverage under the existing VSMP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems and approved your request to terminate permit coverage under the General Permit. The MS4 permitting program is a regulatory program under the Clean Water Act that was "written to apply to storm sewer 'systems' providing storm water drainage service to human populations. . ." [Federal Register, December 8, 1999, Volume 64, Number 235, Page 68749]. The determination that continuation of MS4 permit coverage was not required was made based upon the fact that the discharge of stormwater from the entire facility has been authorized by a Virginia Pollutant Discharge Elimination System (VPDES) permit for industrial stormwater runoff.

A copy of the Board decision is included for your records. The Board will reevaluate its decision to not require MS4 permit coverage if conditions such as land use or VPDES permit coverage are modified in the future. If you have any questions, please contact me at (804) 371-7330.

Sincerely,

J Douglas Fritz

J. Douglas Fritz, MS4 Program Manager

cc: Noah Hill, Regional Office Manager, Suffolk Office
Burt Tuxford, DEQ Central Office

State Parks • Soil and Water Conservation • Natural Heritage • Outdoor Recreation Planning
Chesapeake Bay Local Assistance • Dam Safety and Floodplain Management • Land Conservation

Virginia Soil and Water Conservation Board
November 15, 2007
Association of Electric Cooperatives
4201 Dominion Boulevard
Glen Allen, Virginia

Motion: Hansen
2nd: Dalbec ✓

Agenda Item: Termination of Need for VSMP MS4 Permit Coverage - Southeastern Public Service Authority Landfill

Recommended Board Motion:

The Virginia Soil and Water Conservation Board receives and approves staff recommendation to notify the Southeastern Public Service Authority that it is not required to retain coverage for its landfill under the VSMP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems Registration Coverage Number VAR040102. Stormwater discharges from the facility are authorized under the Virginia Pollutant Discharge Elimination System Permit Number VA0090034.

Agenda Item: Termination of Need for VSMP MS4 Permit Coverage - Norfolk Naval Shipyard

Motion: Hansen
2nd: Altizer ✓

Recommended Board Motion:

The Virginia Soil and Water Conservation Board receives and approves staff recommendation to notify the Norfolk Naval Shipyard that it is not required to retain coverage for its shipyard under the VSMP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems Registration Coverage Number VAR040036. Stormwater discharges from the facility are authorized under the Virginia Pollutant Discharge Elimination System Permit Number VA005215.

Discussion

"The minimum measures for small MS4s were written to apply to storm sewer 'systems' providing stormwater drainage service to human populations and not individual buildings." [National Pollutant Discharge Elimination System—Regulations for Revisions of the Water Pollution Control Program Addressing Storm Water Discharges; Final Rule; Volume 64, Number 235, Page 68,749 December 8, 1999]. These facilities are industrial facilities in which the authorization to discharge stormwater has been authorized by VPDES permits issued by the Department of Environmental Quality. The duplication of permit coverage under two NPDES programs is unnecessary.

APPENDIX E

Disclosure Statements

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SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

COVER SHEET FORM DISC-01

Applicant:
Southeastern Public Service Authority(SPSA)

Facility Name:
Boykins TS (SWP 484); Chesapeake TS (PBR 194); Franklin TS (PBR 192); Isle of Wight TS (PBR 193); Ivor TS (SWP 539); Landstown TS (PBR 191); Norfolk TS (PBR 195); Oceana TS (PBR 190); Suffolk TS (PBR 518); Regional Landfill (SWP 417); Tire Processing Facility (PBR072)

Address: 723 Woodlake Drive
City: Chesapeake State: VA Zip: 23320
Telephone: (757) 420-4700

Applicant's Interest:
(Check all applicable boxes)

X Owner
X Operator
☐ Other (explain):

Enter below the names of all key personnel as defined in 9 VAC 20-80-10. A separate DEQ Form DISC-02 must be completed for each individual, corporation, or entity listed.

Key Personnel	Page
1. Rowland Taylor	1
2. Liesel DeVary	3
3. Scott Whitehurst	5
4. Toney Saunders	7
5. Dennis Deffily	9
6. Michael Burgess	11
7. Jackie Harmon	13
8. Alan Py	15
9. Roland Robinson	17
10. Charles Sweitzer	19
11. Brian Ogle	21
12. Darryl Durham	23

Key Personnel	Page
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22.	
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24.	

COVER SHEET

List all agencies **outside the Commonwealth** which have regulatory responsibility over the applicant or have issued any environmental permit or license to the applicant within the past ten years, in connection with the applicant's collection, treatment, storage or disposal of solid or hazardous waste.

Agency Name and Permit or License Type	Expiration Date	State
Not Applicable		

COVER SHEET

List full name and business address of any member of the local governing body or planning commission in which the solid waste management facility is located or proposed to be located, who holds an equity interest in the facility

Full Name	Business Address
Not Applicable	

Remarks or continuation from previous pages:

I certify under penalty of law that the information contained in this disclosure statement and all attachments are, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for.

	Rowland Taylor	Executive Director	July 15, 2010
Signature	Typed or printed full name	Title	Date

STATE OF
COUNTY OF

On this ___ day of __________, 20__, before me personally came_____________ ________________________, who being by me duly sworn, did depose and say that she/he is the person who executed the above disclosure statement and that she/he signed her/his name.

__________________________________ My commission expires

____

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on from DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body of other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form

Name: **Rowland L. Taylor, Executive Director**

SPSA Employee Identification Number: 0002487

Business Address:
Regional Office Building
723 Woodlake Drive
Chesapeake, VA 23320

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address

KEY PERSONNEL

Rowland L. Taylor

Business Experience:

Mr. Taylor became SPSA's Executive Director in August 2008. As Executive Director, Rowland Taylor oversees the financing, construction, operation and maintenance of SPSA's integrated solid waste management system. He is responsible for economic evaluations and projections and contract administration for design development of SPSA's systems. Prior to coming to SPSA, Mr. Taylor worked as:

- Franklin City Manager - 1996 - 2008
- Southampton County Administrator - 1986- 1996
- Southampton County - 1977- 1986
  (Planner, Zoning Administrator, Building Official, Assistant to the County Administrator)
- Classroom English Teacher - 1972 - 1977

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to, or held by, the person named within past ten years.

Permit Type	Agency
Not Applicable	

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable

SOLID WASTE MANAGEMENT FACILITY PERMIT
APPLICANT'S
DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on form DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body or other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form.

Name: **Liesl R. DeVary, Deputy Executive Director**

Business Address:
723 Woodlake Drive
City: Chesapeake State: VA Zip: 23320

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Southeastern Public Service Authority	723 Woodlake Drive, Chesapeake, VA 23320

KEY PERSONNEL

Liesl DeVary

Business Experience:

2009 to Present Deputy Executive Director, SPSA
2005 – 2009 Budget & Finance Director, Isle of Wight County
2001 – 2004 Director of Accounting, State College Area School District, State College, PA
1998 – 2001 Director of Finance, City of Altoona, Altoona, PA
1994 – 2001 Operations Manager, J. Martin Kooman & Associaties, Inc.

List all permits or licenses required for the collection, transportation, treatment, storage, or disposal of solid or hazardous waste issued to or held by the person named within the past ten years. Include waste management facility operator licensing.

Permits and Licenses	**Agency**
Not Applicable	

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named or by a facility at which the person was key personnel. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in the definition of "Disclosure Statement" in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on from DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body of other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form

Name: **Scott D. Whitehurst, Landfill Superintendent**

SPSA Employee Identification Number: 02411

Business Address:
SPSA Regional Landfill
1 Bob Foeller Drive
Suffolk, VA 23434

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Scott D. Whitehurst

Business Experience:

Mr. Whitehurst has worked in various facets of the environmental field for 15 years. He has experience in waste, water and air regulations in Virginia. He holds a Registered Environmental Health Specialist (REHS) certification through NEHA and Class I and II licenses from the Virginia Board of Waste Management Facility Operators. Mr. Whitehurst has been employed by for SPSA for 2 years and is currently fulfilling dual roles as the Regional Landfill Superintendent and overseeing the Division of Environmental Management. He has had a variety of additional environmental and safety training that can be provided upon request.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator Class I and II	Board of Waste Management Facility Operators, Dept. of Professional and Occupational Regulation

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S
DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

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Name: Toney D. Saunders, **Superintendent of Transportation & Transfer Stations**

SPSA Employee Identification Number: 00000112

Business Address:
SPSA Operations Center
4 Victory Boulevard
Portsmouth, VA 23702

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL
Toney D. Saunders

Business Experience:

Mr. Saunders has been employed with SPSA since 1984. As Transportation Superintendent, he was responsible for the planning, organization and management of SPSA's Transportation Department, maintaining timely, efficient hauling services for all SPSA facilities.

As Superintendent of Transportation & Transfer Stations, he is responsible for ensuring proper hauling services and handling of waste flow at all SPSA Transfer Stations in accordance with DEQ rules and regulations.

Prior to SPSA, Mr. Saunders has ten years of transportation experience, six years of military transportation training, and four years as a Fleet Manager for PepsiCo. Mr. Saunders has a Bachelor of Arts in Business Management from Saint Leo College.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Not Applicable.	

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT
APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

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Name: **Dennis Deffily, Norfolk Transfer Station Supervisor**

SPSA Employee Identification Number: 00001048

Business Address:
SPSA Norfolk Transfer Station
3136 Woodland Avenue
Norfolk, VA 23504

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	**Business Address**
Not Applicable	

KEY PERSONNEL

Dennis Deffily

Business Experience:

Mr. Deffily has been employed with SPSA since 1993. He was hired as supervisor for Oceana Transfer Station and after 1.5 years at that site, he became the supervisor at the Norfolk Transfer Station. As supervisor, Mr. Deffily oversees the receipt, separation and transfer of solid waste from SPSA customers. He also is responsible for ensuring the transfer station is operated in compliance with Virginia Solid Waste Management Regulations and other applicable laws and regulations. Mr. Deffily is a retired veteran of the U.S. Army and has worked with the Corps of Engineers and the Director of Engineering and Housing, which was responsible for solid waste management. He earned his High School Equivalency Diploma and completed one year of college at Central Texas College. Mr. Deffily holds a Class I license from the Virginia Board of Waste Management Facility Operators.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	**Agency**
Waste Management Facility Operator Class I License	Virginia Dept. of Professional and Occupational Regulation

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on from DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body of other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form

Name: **Michael M. Burgess, Landfill Supervisor II**
SPSA Employee Identification Number:
Business Addresses: 1 Bob Foeller Drive Suffolk, VA 23434

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Michael M. Burgess

Business Experience:

Mr. Burgess was first employed with SPSA in 1987, working at the Regional Landfill until 1995. He worked as a landfill foreman for a CDD landfill from 1995-2006. In 2008, Mr. Burgess returned to work for SPSA as the Regional Landfill Supervisor, II.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator's License, Class 1 and 2	Virginia Dept. of Professional and Occupational Regulation

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

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Name:	**Jackie Harmon, Landstown Transfer Station Supervisor**
SPSA Employee Identification Number: 00000359	
Business Address: SPSA Landstown Transfer Station 1825 Concert Drive Virginia Beach, VA 23456	

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Jackie "JR" Harmon

Business Experience:

Jackie Harmon has been employed with SPSA since 1987. He has been the supervisor of the Landstown Transfer Station since 1997 and prior to that he was a supervisor at the RDF Plant. He is responsible for ensuring that the transfer station is operated in compliance with Virginia's Solid Waste Management Regulations and other applicable laws and regulations. Prior to his employment with SPSA, Mr. Harmon worked as a land surveyor for Robertson Engineering. He is certified as a mine foreman in Virginia and has a Class I license from the Commonwealth's Board of Waste Management Facility Operators. He is also qualified as a confined space entry supervisor and electrician.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator's Class I License	Virginia Dept. of Professional and Occupational Regulation

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on from DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body of other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form

Name:	**Alan Py, Transfer Station Supervisor II**
SPSA Employee Identification Number: 00001062	

Business Address: Franklin Transfer Station 32521 General Thomas Highway Franklin VA 23702	Isle of Wight Transfer Station 13191 Foursquare Road Smithfield, VA 23327
Ivor Transfer Station 36439 General Mahone Blvd Ivor, VA 23866	Boykins Transfer Station 18449 General Thomas Highway Boykins, VA 23827

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL
Alan Py

Business Experience:

Mr. Py has been employed with SPSA since May 1993. He worked five years as a supervisor at the RDF Plant. He was then promoted to the Shift Supervisor of the Landstown Transfer Station, where he was employed for five years. In May 2003, Mr. Py was promoted to supervisor of the Chesapeake Transfer Station. He holds a Class I License from the Virginia Board of Waste Management Facility Operators. In July 2006, Mr. Py was promoted to the position of Transfer Station Supervisor II. He was also relocated to the RDF Plant in Portsmouth where he currently manages the operations associated with the tipping floor.

In August 2008, Mr. Py relocated from the RDF Plant responsibilities to the responsibilities of the Isle of Wight, Franklin, Boykins, and Ivor Transfer Stations. Alan Py retains the position of Supervisor II at these new locations.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator’s Class I License	Virginia Dept. of Professional and Occupational Regulation

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

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Name:	**Roland Robinson, Chesapeake Transfer Station Supervisor**
SPSA Employee Identification Number: 00000890	
Business Address: 901 Hollowell Lane Chesapeake, VA 23320	

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Roland Robinson

Business Experience:

Mr. Robinson has been employed with SPSA since 1991, beginning as a Transfer Vehicle Operator. From 1992 to 2003 at Norfolk Transfer Station, Mr. Robinson worked as a Heavy Equipment operator, Senior Operator, and Shift Supervisor. Mr. Robinson was promoted to supervisor of the Oceana Transfer Station in 2004. In 2005, Mr. Robinson was transferred as supervisor of the newly constructed Suffolk Transfer Station. In July 2006, Mr. Robinson was transferred as supervisor of the Chesapeake Transfer Station. As such, he is responsible for ensuring that the facility is operated in compliance with Virginia's Solid Waste Management Regulations. His pre-SPSA work experience includes two years in heavy construction / utilities as an Equipment Operator and six years in the military as an Equipment Operator / Supervisor. He holds a Class 1 license from the Virginia Board of Waste Management Facility Operators.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator's Class I License	Virginia Department of Professional and Occupational Regulation

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

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Name: **Charles Sweitzer, Oceana Transfer Station Supervisor**

SPSA Employee Identification Number: 00001603

Business Address:
2025 Virginia Beach Boulevard
Virginia Beach, VA 23454

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Charles Sweitzer

Business Experience:

Mr. Sweitzer has been employed with SPSA since 1999 and has worked as a Senior Operator, RDF Shift Supervisor and has been supervisor of the Oceana Transfer Station since February 2005. Mr. Sweitzer is responsible for ensuring that the facility is operated in compliance with Virginia's Solid Waste Management Regulations. His pre-SPSA work experience includes two years in heavy construction / utilities as an Equipment Operator and twenty-three years in the military as a Landing Craft Air Cushion vehicle Pilot. He holds a Class I, II, and III license from the Virginia Board of Waste Management Facility Operators.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator Class I, II, and III Licenses	Dept. of Professional and Occupational Regulation Commonwealth of Virginia

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on from DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body of other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form

Name: **Brian Ogle, Tire Facility Supervisor**

SPSA Employee Identification Number: 00001832

Business Address:
1 Bob Foeller Drive
Suffolk, VA 23434

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Brian Ogle

Business Experience:

Mr. Ogle has been employed with SPSA since February 2002, beginning as a Solid Waste Assistant II at the Landstown Transfer Station, in Virginia Beach. In February 2003, Mr. Ogle was promoted to Heavy Equipment Operator Senior at the Landstown Transfer Station, overseeing the second and third shift at the facility. In September 2006, Mr. Ogle transferred to the Suffolk Transfer Station continuing as a Heavy Equipment Operator Senior. In January 2007, he was promoted to Tire Facility Supervisor at the Tire Processing Facility in Suffolk. His responsibilities include overseeing operations of facility and personnel, maintaining the facility in compliance with Virginia's Solid Waste Management Regulations, and meeting production quotas for processing tires.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Not Applicable	

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

SOLID WASTE MANAGEMENT FACILITY PERMIT APPLICANT'S

DISCLOSURE STATEMENT

KEY PERSONNEL FORM DISC-02

Form DISC-02 must be completed for each of the key personnel listed on from DISC-01. The information on the form is specific to the key personnel whether the key personnel is an individual, corporation, partnership, association, government body of other legal entity. See the definition of "key personnel" and "person" in 9 VAC 20-80-10. The information on equity interest, permits and licenses, and violations and criminal history required by this form is specific to the "person" listed on the form

Name: **Darryl Durham, Suffolk Transfer Station Supervisor**

SPSA Employee Identification Number: 0001491

Business Address:
1 Bob Foeller Drive
Suffolk, VA 23434

List full name and business address of any entity, other than natural person, that collects, transports, treats, stores, or disposes of solid or hazardous waste in which the above named person holds an equity interest of five percent or more.

Company Name	Business Address
Not Applicable	

KEY PERSONNEL

Darryl Durham

Business Experience:
Employed with SPSA since 1998, Mr. Durham began as a Heavy Equipment Operator (HEO) at the SPSA Suffolk Composting Facility. In 2001, Mr. Durham transferred to Landstown Transfer Station as an HEO, Sr. In 2003, he was promoted to Supervisor of the Tire Processing Facility. In 2006, Mr. Durham was promoted to Transfer Station Supervisor of the RDF Tipping Floor Operations. In September 2008, he transferred to Suffolk Transfer Station as the Transfer Station Manager.

List all permits or licenses for collection, transportation, treatment, storage, or disposal issued to or held by the person named within past ten years.

Permit Type	Agency
Waste Management Facility Operator Class 1 License	Dept. of Professional and Occupational Regulation Commonwealth of Virginia

List and explain any notices of violation, prosecution, administrative orders, license or permit suspensions or revocations, or enforcement actions of any sort by any state, federal, or local authority, within the past ten years, which are pending or have concluded with a finding of violation or entry of a consent agreement, regarding an allegation of civil or criminal violation of any law, regulation or requirement relating to the collection, transportation, treatment, storage or disposal of solid or hazardous waste by the person named. Furnish also an itemized list of all convictions within ten years of any of the crimes listed in Section 10.1-1400, Virginia Waste Management Act, punishable as felonies under the laws of the Commonwealth or the equivalent thereof under the laws of any other jurisdiction. Use continuation sheets, if necessary.

Not Applicable.

APPENDIX F

Proof of Financial Responsibility

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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.virginia.gov

L. Preston Bryant, Jr.
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

February 15, 2008

Mr. Clement Mikowski
Controller
Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

RE: Virginia Solid Waste Financial Assurance Requirements

Dear Mr. Mikowski:

The Virginia Department of Environmental Quality (Department) has completed its review of the increase amendment to letter of credit No. LC874-117192. This letter of credit was submitted by the Southeastern Public Service Authority (SPSA) to demonstrate financial assurance for the solid waste facilities it operates in Virginia. This amendment has been prepared in accordance with the Virginia Financial Assurance Regulations for Solid Waste Disposal, Transfer and Treatment Facilities, 9 VAC 20-70; therefore, SPSA has met its financial assurance demonstration obligation **until February 3, 2009.**

You may contact me at (804) 698-4006 if you have questions or require assistance. Thank you for your time and consideration in this matter.

Sincerely,

Scott Rudd

Scott Rudd
Financial Assurance Manager

cc: Milt Johnston, DEQ/TRO
Debra Trent, DEQ/TRO
Sean Priest, DEQ/TRO
Keith Primm, DEQ/TRO

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APPENDIX G

Relevant Correspondence

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APPENDIX H

Odor Control Plan

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APPENDIX H
Odor Control Plan

SPSA will proactively work to minimize odor associated with the operation of the Regional Landfill. Specific activities to reduce odor will include:

- Covering incoming waste on a frequent basis
- Activating odor neutralizing system when odor is detected and/or when the wind direction is toward surrounding residential areas
- Installing a gas collection system in Cell VI to flare or beneficially reuse methane gas
- Initiating the Odor Response Plan detailed in EMS SOP 1.33 when odor complaints are received.

I. Frequent Covering of Wastes

Virginia's Solid Waste Management Regulations require that waste disposed of at a sanitary landfill be covered at the end of each operating day or at more frequent intervals as necessary to control disease vectors, fires, odors, blowing litter and scavenging. Because the Regional Landfill operates on a 24-hour basis, per day with no official end to the operating day, SPSA has established a schedule for covering wastes to minimize odors. At minimum, daily cover will be applied during the evening shift or should the landfill no longer operate a 24 hour schedule, the landfill will cover waste at the end of the final operating shift each day. The Landfill Superintendent or his designee will ensure there is sufficient cover material stockpiled on the working face before leaving each day. Upon his arrival the next day, he will verify that the working face was sufficiently covered. In addition, SPSA will continue its practice of covering highly putrescible wastes upon arrival. A trench will be dug to deposit the waste and cover material will be immediately applied.

II. Odor Neutralizing System

An odor neutralizing system will be installed along the perimeter of Cell VI, the active cell of the landfill. This system will be activated whenever weather forecasts indicate a wind direction towards the surrounding residential areas. The Landfill Superintendent or his designee will monitor wind direction on a daily basis. The neutralizing system will also be activated in response to documented odor complaints as described in EMS SOP 1.33. It shall be noted, however, that the landfill is testing different odor suppression systems which may or may not include operating the system installed on the perimeter of the cell. The landfill has tested a neutralizing product added to the water for dust control and is applied to the roads around the facility.

III. Gas Collection System

The existing gas collection system in Cell V will be expanded into Cell VI. Initially temporary collection will begin by extending existing laterals to the leachate vaults serving Cell VI. There are four vaults in Cell VI. Vertical gas extraction wells will be installed in Cell VI in general accordance with the Facility's Landfill Gas Collection and Control System Design Plan as referenced in the

Landfill Gas Management Plan. These wells will be a part of the permanent collection system. Once installed, methane gas will be continually withdrawn from all landfill cells and either burned by the existing flare or beneficially reused. It is anticipated that the wells will be installed by late summer/early fall 2010.

IV. Odor Response Plan

SPSA has developed a detailed Odor Response Plan to address odor complaints concerning any of its waste handling facilities. This plan is detailed in the attached EMS SOP 1.33. SPSA personnel have been trained on this procedure.

V. Odor Source ID at the SPSA Regional Landfill

1. Leachate Ponds

Odor may be noted during the warmer months associated with the leachate ponds. Staff will confirm that all four aerators are operational. Leachate conditions will be noted, mainly color. Deodorizer product may be added to the aeration pond if an odor is determined to be coming form the leachate ponds.

2. Gas Collection System

If a positive vacuum condition exists at gas collections wells, a well may emit landfill gas (LFG). LFG may contain various compounds which could produce a malodor. If it is noted that a well does have a positive vacuum condition, the SPSA LFG Contractor will be notified and the well will be adjusted to a negative vacuum condition. The well field is currently inspected and adjusted on a weekly basis, which is planned to continue.

3. Leachate Collection Vaults

The leachate collection vaults may have odor associated with the collection of LFG and leachate. If odor is noted at a leachate collection vault, the vault will be checked for leaks and scheduled for repair. While conducting maintenance on pumps in the vaults, if a pump has to be pulled the flange will be reset and tightened during the repair period.

4. Working Face

Based on the current Virginia Solid Waste Management Regulations, landfill staff currently are covering at better than the daily cover requirement. This condition will continue during periods which may produce increases in malodor, such as periods of heavy rain. In addition, cover material will be staged at the working face later in the day for ease of cover operations at close of business. All trash should be covered by the end of the day.

ATTACHMENT II-1

Unauthorized Waste

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SPSA

Southeastern Public Service Authority's

Unauthorized Waste Control Plan

Last Revised
July 1, 2010
Updated February 2011


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SPSA Document Management Form
Records of Revisions

Document Name: _______*Unauthorized Waste Control Plan*______________________
Written By: __________Scott Whitehurst________________ Dept.: ____*DEM*________
Previous Approved Manual Dated: ________*June 30, 2010*____________________________
Date of Current Manual: ______________*February 8, 2011*___________________________

Revision Date	Page #	Revision Description
6/30/10	ALL	• Entire Document scrubbed due to changes in organizational structure and updating of procedures.
2/8/11	3, 12, 15, 24	• Remove references to RDF Plant.

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SPSA's Unauthorized Waste Control Plan
Table of Contents

APPENDICES

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Section 1.0
Definitions

The following words and terms when used in this chapter shall have the following meaning unless the context clearly indicates otherwise:

"Commercial waste" means all solid waste generated by establishments engaged in business operations other than manufacturing or construction. This category includes, but is not limited to, solid waste resulting from the operation of stores, markets, office buildings, restaurants and shopping centers.

"Construction waste" means solid waste which is produced or generated during construction, remodeling, or repair of pavements, houses, commercial buildings, and other structures. Construction wastes include, but are not limited to lumber, wire, sheetrock, broken brick, shingles, glass, pipes, concrete, paving materials, and metal and plastics if the metal or plastics are a part of the materials of construction or empty containers for such materials. Paints, coatings, solvents, asbestos, any liquid, compressed gases or semi-liquids and garbage are not construction wastes.

"Contaminated soil" means, for the purposes of this plan, a soil that, as a result of a release or human usage, has absorbed or adsorbed physical, chemical, or radiological substances at concentrations above those consistent with nearby undisturbed soil or natural earth materials.

"Corrosive Materials" are items capable of causing serious chemical burns. See also "Toxic Materials."

"Flammable materials" are materials that can be easily ignited. See also "Ignitable Wastes." Flammable materials may be in the forms of gases and aerosols, and flammable and combustible liquids

"Free liquids" means liquids which readily separate from the solid portion of a waste under ambient temperature and pressure as determined by the Paint Filter Liquids Test, Method 9095, U.S. Environmental Protection Agency, Publication SW-846.

"Friable asbestos" means any waste material containing more than 1.0 percent asbestos as determined using the polarized light microscopy methods specified in 40 CFR Part 763, Appendix E, Subpart E, Section 1, that, when dry, is capable of being crumbled, pulverized or reduced to powder by hand pressure.

"Hazardous waste" means a "hazardous waste" as described by the Virginia Hazardous Waste Management Regulations (9VAC20-60).

"Household hazardous waste" means any waste material derived from households (including single and multiple residences, hotels, motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas) which, except for the fact that it is derived from a household, would otherwise be classified as a hazardous waste in accordance with 9VAC20-60.

"Household waste" means any waste material, including garbage, trash and refuse, derived from households. Households include single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas. Household wastes do not include sanitary waste in septic tanks (septage) which is regulated by other state agencies.

"Ignitable waste" means: (i) Liquids having a flash point of less than 140°F (60°C) as determined by the methods specified in the Virginia Hazardous Waste Management Regulations (9VAC20-60); (ii) non-liquids liable to cause fires through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or liable, when ignited, to burn so vigorously and persistently as to create a hazard; (iii) ignitable compressed gases, oxidizers, or both.

"Industrial waste" means any solid waste generated by manufacturing or industrial process that is not a regulated hazardous waste. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: Electric power generation; fertilizer/agricultural chemicals; food and related products/by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment. This term does not include mining waste or oil and gas waste.

"Inert waste" means solid waste which is physically, chemically and biologically stable from further degradation and considered to be non-reactive. Inert wastes include rubble, concrete, broken bricks, bricks, and blocks.

"Institutional waste" means all solid waste emanating from institutions such as, but not limited to, hospitals, nursing homes, orphanages, and public or private schools. It can include regulated medical waste from health care facilities and research facilities that must be managed as a regulated medical waste.

"Liquid waste" means any waste material that is determined to contain "free liquids" as defined by this chapter.

“Nonfriable asbestos” is classified in two categories: "Category I nonfriable asbestos-containing material (ACM)" means asbestos-containing packing, gaskets, resilient floor covering, and asphalt roofing products containing more than 1.0 percent asbestos, as specified in 40 CFR Part 763, Appendix E, Subpart E, Section 1, that are wastes. "Category II nonfriable asbestos-containing material (ACM)" means any material, excluding Category I nonfriable ACM, containing more than 1.0 percent asbestos, as specified in 40 CFR Part 763, Appendix E, Subpart E, Section 1, that, when dry cannot be crumbled, pulverized, or reduced to powder by hand pressure and that are wastes.

“Oxidizers” are chemicals that contain oxygen in a form that is easily released. Oxidizers can release concentrated oxygen if heated or mixed with other materials, causing spontaneous fires or even explosions. Examples of oxidizers include bleach and pool chemicals.

"PCB" means any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance (see 40 CFR 761.3).

"Proprietary waste" is off spec or expired materials, products, confidential documents and other non-hazardous waste items requiring thermal destruction.

"Putrescible waste" means solid waste which contains organic material capable of being decomposed by micro-organisms and cause odors.

"Reactive Wastes" are wastes that can react with itself, air or water in a violent or hazardous manner. Examples of reactive wastes includes explosives, pyrophoric chemicals (ignite on contact with air), and peroxide-forming compounds (ether).

"Regulated hazardous waste" means a solid waste that is a hazardous waste, as defined in the Virginia Hazardous Waste Management Regulations (9VAC20-60), that is not excluded from those regulations as a hazardous waste.

"Regulated medical waste" means solid wastes so defined by the Regulated Medical Waste Management Regulations (9VAC20-120) as promulgated by the Virginia Waste Management Board.

"Sandblast" is commercially available abrasive material commonly used to prepare a surface for finishing. Common abrasives include Coal Slag (Black Beauty, Black Diamond, Black Blast), Silica Sand, Aluminum Oxide, Garnet, Steel Shot & Steel Grit.

"Sludge" means any solid, semi-solid or liquid waste generated from a municipal, commercial or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of treated effluent from a wastewater treatment plant.

"Solid waste" means any of those materials defined as "solid waste' in Part III (9VAC20-80-140 et seq.) of this chapter.

"Special wastes" mean solid wastes that are difficult to handle, require special precautions because of hazardous properties or the nature of the waste creates waste management problems in normal operations.

"TCLP" (Toxicity Characteristic Leaching Procedure) – SW-846 Method 1311 is a complex testing procedure which extracts constituents from solid waste in a manner which simulates the leaching action that can occur in an ordinary sanitary landfill. Maximum contaminant concentrations can be found in 40 CFR Part 261.24 Table I.

"Toxic materials" are those substances with potential to cause damage to human tissues and/or systems if they gain entry into the body. Health hazards of toxic materials are a determined by the chemical itself and by the way in which it is used.

"Unauthorized waste" is any waste that SPSA does not accept for disposal at its facilities due to regulatory requirements, handling requirements, and/or safety requirements.

"Vegetative waste" means decomposable materials generated by yard and lawn care or land clearing activities and includes, but is not limited to, leaves, grass trimmings, woody wastes such as shrub and tree prunings, bark, limbs, roots, and stumps. For more detail see 9VAC20-101.

"White goods" means any stoves, washers, hot water heaters, and other large appliances that may contain Freon.

"Yard waste" means decomposable waste materials generated by yard and lawn care and includes leaves, grass trimmings, brush, wood chips, and shrub and tree trimmings. Yard waste shall not include roots or stumps that exceed six inches in diameter.

Section 2.0
Introduction

2.1 Purpose & Scope

This plan has been developed to ensure the safety of SPSA employees and the protection of the environment in compliance with § 9 VAC 20-80-113 of the Virginia Solid Waste Management Regulations. It is applicable to all permitted SPSA facilities and is to be maintained as an on-site reference document at all facilities. Unauthorized waste is defined as any waste that SPSA does not accept for disposal at its facilities due to regulatory requirements, handling requirements, and/or safety requirements.

2.2 SPSA's Unauthorized Waste Exclusion Policy

The Southeastern Public Service Authority was formed for the purpose of providing environmentally sound solid waste disposal for the communities of southeast Virginia. It is SPSA's policy to accept waste solely meeting criteria established by legislation or statute, and facility permits, as well as those standards set by SPSA's Executive Staff. As such, SPSA does not knowingly accept regulated hazardous or medical waste, or waste excluded by SPSA's policy. SPSA has implemented a rigorous defense system to ensure unauthorized wastes are not accepted at its facilities. This Unauthorized Waste Control Plan describes SPSA's measures to prevent and respond to unauthorized waste disposal in its integrated waste management system.

Section 3.0
Preventing Unauthorized Waste Disposal at SPSA Facilities

SPSA has multiple levels of defense to prevent the disposal of unauthorized wastes at its facilities. These levels include:

- Public notification and education;
- Employee training and awareness;
- Established response and reporting procedures;
- Approval process for special/industrial wastes and proprietary waste;
- Waste Load Inspection Program; and
- Alternative disposal programs.

3.1 Public Notification and Education

SPSA's first level of defense against unauthorized waste disposal includes its efforts to notify the public of the types of waste accepted into its waste management system. In addition, SPSA educates the public of the hazards of improper waste disposal. Various media are use to keep the public informed of SPSA's programs and waste exclusion policies. These include:

- Posted signs at facility entrances;
- SPSA's web page and information line.

Each SPSA facility has signs posted at its entrance informing users of the types of waste accepted at that facility. In addition, signs are posted indicating hazardous waste, and regulated medical wastes are not acceptable. SPSA reserves the right to reject any waste whose origins and characteristics are questionable.

SPSA's an external web page at www.spsa.com, which can be accessed for the same types of information printed in the brochures. SPSA's public information line can be accessed via phone at (757) 424-4297. Callers respond to an automated menu to receive recorded messages concerning the availability of SPSA's facilities and services.

3.2 Employee Training and Awareness

SPSA's philosophy of employees being the authority's greatest asset is especially applicable in the prevention of unauthorized waste disposal at SPSA's facilities. Despite SPSA's best efforts to prevent these wastes from entering the waste system, the reality is some users may knowingly or unintentionally dispose of unauthorized waste at SPSA's facilities. Because of this, SPSA's employees are the second line of defense to intercept unauthorized wastes. Employees are trained to recognize unauthorized materials in the incoming waste stream. In addition, SPSA has established response and reporting procedures in the event that unauthorized wastes are detected at any SPSA facility. The following summarizes content of training given to the different level of SPSA employees.

3.2.1 Supervisors and Designated Responders

SPSA's Unauthorized Waste Training Program is designed to help supervisors and designated responders identify and address potential waste hazards in the workplace. It is not designed to train personnel as hazardous waste handlers, but to enable them identify unauthorized wastes and then implement procedures to minimize risk to SPSA employees and the environment. The procedures are to be followed whenever a potentially unauthorized waste is identified. The goals of this program are to help personnel:

- Recognize hazardous waste;
- Understand potential hazards; and
- Respond safely.

Supervisors and designated personnel receive this training at their initial employment and then annually thereafter. An outline of the curriculum may be found in Appendix D.

3.2.2 Environmental Specialists

SPSA's Environmental Specialists conduct onsite random load inspections of incoming wastes. The Specialists are required to complete OSHA's 40-hour Hazard Waste Operator (HAZWOPER) training in compliance with OSHA requirements. This training covers the following areas:

- Safe Work Practices
- Environmental and Chemical Hazard Recognition
- Hazardous Waste Characteristics
- Hazard Communication
- Materials Handling
- Toxicology
- Basic Emergency Response and Preparedness
- Site Control and Decontamination

Environmental Specialists are updated annually or more frequently as needed on issues related to hazardous materials.

3.2.3 Other Employees

SPSA's primary concern about hazardous and regulated medical wastes is to protect employees, property, and the environment. In order to achieve this goal, all employees must be prepared to safely respond if a potential hazardous waste is recognized. At a minimum, all employees are trained to:

- Stay alert to the content of all incoming loads;
- Recognize smoke, unusual odors, or vapors emitting from a load of solid waste;
- Look for materials labeled with hazard warnings, such as a picture, symbol, or warning words.
- Contact the facility supervisor and/or designated responder if a hazardous waste is recognized; do not attempt to handle the suspected material.

Employees receive this training at their initial employment and then annually thereafter.

3.3 Unauthorized Waste Response and Reporting Procedures

If a suspicious or questionable material is spotted on the tipping floor, working face or in the process of unloading, employees will:

- Clear the area and immediately notify the supervisor or designated responder.
- Employees are not to move or otherwise handle wastes suspected to be hazardous without the instruction of the supervisor.
- Supervisors will assess the situation and call for help as needed. General contact information for Suspicious/Unauthorized waste incidents may be found in Appendix A on page 18. Specific emergency contact information is maintained on SPSA's EMS website and is posted at each facility.
- Employees will be given appropriate personal protective equipment as necessary.
- In non-emergency situations where the waste generator/transporter can be identified, the generator/transporter is contacted to remove the waste.
- If generator/transporter cannot be identified, SPSA ensures that hazardous waste, regulated medical wastes, or otherwise prohibited waste, are removed and disposed of in accordance with all applicable requirements.
- More detailed response and documentation procedures for responding to Unauthorized Waste incidents may be found in Appendix B.
- Guidance for recognizing suspicious and/or unauthorized Waste may be found in Appendix C.

3.4 Approval Process for Special/Industrial Waste

3.4.1 Special/Industrial Wastes

Special/Industrial wastes require prior approval before being accepted for disposal into SPSA's waste system. Special/industrial wastes are accepted only at the Regional Landfill and require approval from DEQ prior to disposal. SPSA has implemented an application and screening process to ensure these wastes meet established disposal criteria, which are approved for disposal on a case-by-case basis.

Generators of industrial waste are required to obtain prior approval from SPSA's Environmental Supervisor before disposing of waste at the landfill. They must submit an application for disposal and certify that their waste is not hazardous. Applicants must also submit documentation to demonstrate the characteristics (hazardous and non-hazardous) of their wastes. This documentation may include material safety data sheets for the material or reports of analysis of the waste. Parameters that are analyzed include at minimum TPH, BTEX, TCLP metals, TOX, ignitability, corrosiveness, reactivity, and moisture (paint filter test). Additional analyses may be required depending on the nature of the waste. A copy of an application for special/industrial waste disposal may be found in Appendix E.

Approval is valid for the year, and special conditions may apply, i.e., periodic sampling and testing throughout the approval period. SPSA's Environmental Superintendent and scale attendants maintain a list of approved special/industrial waste disposers. Special/Industrial waste-loads are subject to random inspection in accordance with that described below. Criteria for the acceptance of special/industrial wastes may be found in Appendix F.

3.5 Waste Load Inspection Program

3.5.1 Random Waste Inspections

SPSA Random Waste Inspection Program serves as another line of defense against the disposal of unauthorized wastes at SPSA's facilities. SPSA's Department of Environmental Management (DEM) staff performs random inspections of incoming waste loads according to the following protocol. In addition, procedures for performing random waste inspections are outlined in SPSA's EMS SOP 11.2. In accordance with Virginia's regulatory requirements, random inspections are performed on a minimum of one per cent of the commercial waste loads entering the Regional Landfill.

A. <u>Procedures</u>

Random commercial loads are directed to discharge waste in an area designated for waste screening, where a front-end loader spreads out the waste. An Environmental Specialist, wearing the appropriate personal protective equipment, screens the waste to determine if it contains unauthorized waste and/or improperly disposed waste materials. Residentially generated waste is not included in this screening process.

B. <u>Unauthorized Waste Management Procedures</u>

Unauthorized wastes and/or improperly disposed wastes are handled in the following manner:

1. Car batteries and gas cylinders (freon, propane) are removed from the waste stream and recycled through a private contractor.

2. Tires are isolated from the waste stream and hauled to the Tire Processing Facility located at the Regional Landfill where they are shredded and disposed of in the landfill.

3. Unapproved industrial/special wastes (contaminated soil, sandblast, etc.) are rejected and the generator notified of SPSA's Special Waste Application process.

4. Unauthorized wastes such as regulated medical wastes, hazardous wastes and other wastes are segregated and removed by reloading onto the hauler's truck, if still onsite, for return to the generator or removed at the generators' expense. If necessary, a hazardous waste contractor is called to dispose of the suspect waste in a proper manner and the waste hauler or generator is billed for the cost of disposal.

C. Records

A *Random Load Inspection Form* (EMS Form 29) is completed for each waste load inspected, copies of which are maintained at the facility and by Environmental Management staff. These records are retained for a minimum of three years.

If the incident involved waste of a hazardous nature, the Environmental Supervisor will attach or include the inspection information in an *Environmental Incident Report* (EMS Form 34) to the Virginia Department of Environmental Quality. In most cases, photographs are taken of the unauthorized waste and kept on file with the inspection report. Upon request, the waste hauler may be sent a copy of the inspection report and *Environmental Incident Report*. Repeat hazardous waste generators are suspended from utilizing SPSA facilities until the problem is resolved. A copy of the Random Load Inspection Form may be found in Appendix H.

3.5.2 Routine Waste Load Inspections

Operational personnel at all SPSA waste management facilities are trained to screen every incoming waste load for unauthorized waste materials. Employees remain on alert for containers bearing hazardous waste symbols and waste items emitting strong odors, smoke or reacting with surrounding materials. In the event that an unauthorized or suspect waste is discovered at any facility, employees follow the Unauthorized Waste Response and Reporting Procedures described in Section 3.3 of this plan. The procedures for performing routine waste load inspections are also outlined in SPSA EMS SOP1.9.

3.6 Alternative Waste Collection Programs

SPSA's Household Hazardous Waste Collection program was established to remove exempt hazardous waste materials from its waste stream. Residents ONLY are encouraged to bring waste items such as pesticides, waste oil, latex paint, pool chemicals, etc., to one of SPSA's Household Hazardous Waste (HHW) Collection Facilities that are strategically located throughout the service area. Table 1 shows the locations of these facilities. These wastes are bulked and packaged for disposal by SPSA's hazardous waste disposal contractor. This service is offered to residents free of charge. Residents can obtain information about the HHW program by accessing SPSA's web page or calling the information line, (757) 424-4297.

Table 1

SPSA Household Hazardous Waste Facility Schedule

Facility Name	Location	Days Operated	Hours of Operation
Chesapeake TS	901 Hollowell Lane Chesapeake, VA	Third Saturday and First Wednesday monthly	9 AM to 12:00 PM
Franklin TS	30521 General Thomas Highway, Franklin	Last Thursday monthly	9 AM to 12:00 PM
Isle of Wight TS	13191 Four Square Road Smithfield, VA	Third Friday monthly	9 AM to 12:00 PM
Landstown TS	1825 Concert Drive Virginia Beach, VA	Second Saturday monthly	9 AM to 12:00 PM
Norfolk TS	3136 Woodland Avenue Norfolk, VA	First Saturday and Fourth Wednesday monthly	9 AM to 12:00 PM
Mobile Event	Portsmouth, VA	As Requested	As Requested
Regional Landfill	1 Bob Foeller Drive Suffolk, VA	Monday through Saturday	8 AM to 4 PM
Virginia Beach Landfill II	1991 Jake Sears Road Virginia Beach, VA	Monday through Saturday	8 AM to 4 PM

Other Mobile HHW Collection Events may be held at individual city requests.

Section 4.0

Unauthorized Waste Lists

4.1 Unauthorized Waste for All SPSA Facilities

The following waste types are unacceptable at all SPSA facilities, including the Regional Landfill.

- Appliances with freon
- Hazardous wastes
- Large animal carcasses
- Liquids
- Slaughterhouse waste
- Unapproved industrial process waste
- Cable, wire, rope, etc. over six feet in length
- Rigid items over six feet in length (i.e.: pipe, timber, metal stock, construction materials, etc.)
- Closed drums
- Unapproved loads of paint cans
- Unapproved loads of drums
- Materials containing friable asbestos
- PCB wastes
- Regulated medical wastes

4.2 Unauthorized Waste at SPSA's Transfer Stations

The following waste types are unacceptable at SPSA's Transfer Stations, but *may* be accepted at the Regional Landfill, some requiring prior approval.

- Animal carcasses
- Dust (i.e.: sawdust, sanding dust)
- Industrial process waste (i.e.: ash, contaminated soil, process residue)
- Large tree trunks and stumps
- Heavy construction rubble (i.e.: large broken concrete, solid loads of earth, sand or gravel, timbers in excess of 4x4 and/or over six feet in length, re-bar and structural steel over six feet in length)
- Automotive tires over four per load
- Earthmover and agricultural equipment tires
- Loads of paint cans
- Loads of drums

Appendix A

Suspicious/Unauthorized Waste Contact List

General contact information for suspicious or Unauthorized Waste incidents is provided below. Specific emergency contact information with names and cell phone numbers is posted at each facility and is also maintained on SPSA's EMS website.

1. *In case of emergency*, DIAL 911!
2. SPSA Facility Contact Numbers

Site	Department	Name	Job Title	Extension	Phone Number	Cell Number	Direct Connect
ROB	Accounting	Geralyn Harrel	Accounting Supervisor	329	961-3463		
ROB	Accounting	Kaye Woods	Payroll Specialist	314	961-3458		
ROB	Accounting	Teresa Jenkins	Accounting Technician	315	961-3459		
ROB	Executive Admin	LouAnn Ivory	Executive Assistant	327	961-3461		
ROB	Executive Offices	Bucky Taylor	Executive Director	326	961-3740	377-7060	
ROB	Executive Offices	Liesl DeVary	Deputy Executive Director Admin	325	961-3402	418-0502	
ROB	Human Resources	Adele Pelzel	Human Resources Analyst	306	961-3419		
ROB	Human Resources	Ken Decker	Human Resources Manager	308	961-3426		
ROB	Human Resources	Madonna Villaire	HRIS Analyst	303	961-3487		
ROB	Information Technology	Blanche Christian	Technical Support Coordinator	338	961-3424		
ROB	Information Technology	David Gabriel	Network Administrator I	322	961-3445	418-0517	166*18726*55
ROB	Information Technology	Jim VandenAkker	Network Manager	321	961-3456	418-0531	
ROB	Information Technology	Lan Dinh	ERP Systems Analyst	333	961-3481		
ROB	Purchasing	Millard Grant	Procurement Specialist	330	961-3485	328-9114	
ROB	Purchasing	Steve Coomer	Purchasing Administrator	331	961-3486	418-0288	
OPS	Executive-Operations	Bucky Taylor	Executive Director	410	961-4059	377-7060	
OPS	Transportation	Toney Saunders	Superintendent Transfer Station Trans	411	961-3556	449-5350	166*18726*2
OPS	Contract Compliance	Charlie Fagg	Contract Compliance Officer	424	961-3473	681-4328	
OPS	Fleet Maintenance	Patrick Lee	Vehicle/Equip Maintenance Supt	412	961-3562	449-1309	166*18726*185
OPS	Fleet Maintenance	Dene Weaver	Fleet Support Specialist	413	961-3567		
OPS	Fleet Maintenance	Shirley Elbrecht	Storeroom Supervisor	414	961-3568		
OPS	Fleet Maintenance	Norm Strickland	Vehicle/Equip Maintenance Supv	415	961-3572	449-1830	166*18726*154
OPS	Fleet Maintenance	Amber Ferebee	Storekeeper	416	961-3579		
OPS	Fleet Maintenance	OPS Mechanics	Mechanics	433	961-3751		
OPS/TSP	Transportation	Tim Strickland	Transportation Operations Manager	417	961-3684	418-3570	166*134*8
OPS/TSP	Safety	Jim Penney	Safety Specialist	418	961-3697	309-7387	166*18726*34
OPS/TSP	Safety	John Spivey	Workers Compensation Coordinator	419	961-3712	449-3910	166*18726*19
SLF	Executive- Suffolk Landfill	Bucky Taylor	Executive Director	525	961-4085	377-7060	
SLF	Suffolk Landfill	Scott Whitehurst	Landfill Superintendent	510	961-3582	449-5349	
SLF	Suffolk Landfill	Michael Burgess	Landfill Supervisor II	511	961-3583	449-6351	166*18726*9
SLF	Suffolk Landfill	Ron Williams	Landfill Supervisor I	512	961-3593	449-6359	166*18726*17
SLF	Fleet Maintenance	LDF Mechanics	Mechanics	513	961-3597	328-7248	166*18726*30
SLF/STS	Household Hazardous Waste	Mike Kelley	Enviromental Specialist	518	961-3674	418-3562	166*18726*64
SLF/STS	Tire Shredder Facility	Brian Ogle	Tire Facility Supervisor	516	961-3668	417-5387	166*134*133

SLF	Suffolk Landfill	Greg Jones	Landfill Supervisor	521	961-3868		
VBLF	Virginia Beach Landfill	Robert Scott		520	961-3743		
CTS	Chesapeake Transfer Station	Roland Robinson	Transfer Station Supervisor I	528	961-3942	449-6355	166*18726*13
LTS	Landstown Transfer Station	J.R. Harmon	Transfer Station Supervisor II	533	961-3985		
OTS	Ocena Transfer Station	Chuck Sweitzer	Transfer Station Supervisor I	535	961-4052	438-6616	166*18726*26
NTS	Norfolk Transfer Station	Dennis Deffily	Transfer Station Supervisor II	530	961-3980		
NTS	Norfolk Transfer Station	NTS Mid Office		532	961-3978		
STS	Suffolk Transfer Station	Darryl Durham	Transfer Station Supervisor I	514	961-3627		
INB/SH	Inbound Scalehouse	RDF Scalehouse		422	961-3741		
IWTS/SH	Scalehouse	IWTS Scalehouse		526	961-3874		
CTS/SH	Scalehouse	CTS Scalehouse		529	961-3943		
FTS/SH	Scalehouse	FTS Scalehouse		527	961-3877		
LTS/SH	Scalehouse	LTS Scalehouse		534	961-3986		
NTS/SH	Scalehouse	NTS Scalehouse		531	961-3981		
OTS/SH	Scalehouse	OTS Scalehouse		536	961-4054		
SLF/SH	Scalehouse	LDF Scalehouse		519	961-3683		
ROB	Virtual	HR Virtual		380			
ROB	Virtual	Accounting Virtual		381			
ROB	Virtual	Purchasing Virtual		382			
OPS/TSP	Virtual	Safety Virtual		499			

3. Designated Responders-SPSA Environmental (757) 418-3564

4. Department of Environmental Quality-Tidewater Regional Office: (757) 518-2000

Appendix B
Suspicious/Unauthorized Waste Response Procedures

1. Immediately clear area of all SPSA employees, customers and citizens.

2. Do NOT attempt to move or handle suspicious/unauthorized waste without the instruction of the Supervisor.

3. Notify Supervisor of presence of suspicious/unauthorized waste.

4. Supervisor will assess situation and follow the below procedures:

5. If necessary, the Supervisor will:

    a. Call *911* if there is an immediate threat to human health or the environment.

    b. Distribute appropriate personal protective equipment to employees.

    c. Contact a designated responder at 539-9373, ext 305. Contact the Environmental Supervisor at 757-418-3564 (cellular) for all incidents.

    d. Retain waste hauler if still present on site.

6. Notify the Supervisor immediately if you experience any of the following:
    a. Dizziness or nausea
    b. Burning itching of your eyes, skin, nose or throat
    c. Shortness of breath
    d. Other signs of illness

7. Follow the instructions of the Fire Department or Designated Responder. Contact the Safety Department's on call pager at 393-5750 immediately if employee is suspected of exposure to unauthorized waste.

8. The Supervisor will document each unauthorized waste incident as follows:

    Complete *UAW Short Form* (forms on pages 20 and 21)

    - Non-hazardous UAW found in a commercial load while tipping - Load back on delivering truck – Document on *Short Form* (EMS Form 32 A & 32 B)

    - Non-hazardous UAW found on tipping floor or in working face/surrounding area with no identifiable responsible party – Deliver to appropriate disposal area (Tire Processing Facility, Household Hazardous Waste Collection Facility, White Goods, etc.), render material authorized (cut to <6', open drums at both ends and crush, etc.), or request Environmental Staff assistance when necessary - Document on *Short Form*

Some examples of non-hazardous items include tires, empty drums, white goods w/Freon, containers of liquid, items larger than 6’ in any direction, unapproved loads of paint cans, unapproved industrial wastes, etc.

9. SPSA’s DEM Staff are to be notified immediately when an unauthorized waste incident involves hazardous or regulated medical waste. Specifically, call the Environmental Supervisor:

   - Potentially hazardous waste or regulated medical waste is found while tipping (Leave waste in place, hold commercial truck.)

   - Potentially hazardous waste or regulated medical waste is found on the tipping floor, in working face or in surrounding areas—(Leave waste in place.)

   - Any other scenario in which improper disposal of waste has occurred.

10. SPSA’s DEM Staff will complete an *Environmental Incident Report* (EMS Form 34) for each hazardous or regulated medical waste incident and submit a copy to the VDEQ.

    Some examples of potentially hazardous waste would be any container with a DOT hazard warning label/Hazardous Waste Label/Symbol recognized to warn of danger, any drum which is other than empty, any sealed drum, etc.

UAW SHORT FORM FOR LDF

Obtain from SPSA EMS Website

UAW SHORT FORM FOR Transfer Stations
Obtain from SPSA EMS Website

SPSA

Southeastern Public Service Authority
Environmental Incident Report

Date: ________________ Time: _____________ Hauler: ________________________________

Facility: _____________________________________ Completed by: __________________________

Waste Generator: ____

Address: ____

City/State: ____ Zip: ______________________

Phone: ___________________________________ Fax: __________________________________

Contact: __________________________________ Title: __________________________________

Incident Type: (Check all that apply)

☐ Hazardous Waste
☐ Spill/release
☐ Prohibited Waste
☐ Regulated Medical Waste
☐ Other: __________________________

Description: (Include waste type, location, quantities involved, etc. Attach photos when applicable.)

____

____

____

Actions Taken: ____

____

____

____

____

If incident was reported to DEQ, enter assigned IR # here: ___________________________

Follow-up Actions Required: If none, check here. ☐ None required.

____

____

____

____

Completed by:

____ _____________________________________

Signature Date

EMS Form 34-Environmental Incident Report

Printed versions of EMS forms are uncontrolled. Check EMS website for latest revision before completing.

Appendix C
Recognizing Suspicious/Unauthorized Waste

1. Remain aware of all incoming loads.

2. Remain alert to any smoke, unusual odor, fumes or vapors emitting from a load of solid waste.

3. Remain alert for materials labeled with hazard warnings. This may be a picture, symbol or warning word.

4. Remain alert for materials disposed of in red medical waste bags.

5. Report all suspicious or unauthorized waste to your supervisor.

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Appendix D
Supervisor/Designated Responder Training Curriculum

The Southeastern Public Service Authority has provided this training program to help you as supervisors/designated responders, identify and address potential waste hazards in the workplace. It is not designed to train you to be hazardous waste handlers but to be familiar with the basic types of hazardous wastes, how they can be identified, and the safe working practices and procedures to be followed should a potential hazardous waste be identified.

Supervisors/designated responders at the transfer stations and Regional Landfill must be able to identify potential hazardous waste, assess the situation to determine what is involved and know the proper procedures to be followed in addressing the situation. Hazardous materials possess one or more of the following properties:

- Fire hazard or ignitable
- Reactive hazard
- Pressure hazard
- Corrosive hazard
- Toxicity hazard

These hazards are discussed in further detail below.

Flammable Materials

The properties that make flammable substances hazardous include:

- They are easily ignited
- They are often heavier than air resulting in slower dissipation and increasing the chance of ignition
- Gas-air or vapor mixtures can explode violently

Flammable materials may be in the forms of gases and aerosols, and flammable and combustible liquids. Materials labeled "flammable" pose a severe fire hazard while materials labeled "combustible" poses a moderate fire hazard. Propane is an example of an extremely flammable gas. Discarded gasoline is one of the more common flammable liquids found in the waste stream on a regular basis. Flammable materials are identified by their Department of Transportation (DOT) labels and by their product labels.

An additional fire hazard is found in the form of oxidizers: Oxidizers are chemicals that contain oxygen in a form that is easily released. Oxidizers can release this concentrated oxygen if heated or mixed with other materials. This can cause spontaneous fires or even explosions. The risk of oxygen gas cylinders is increased by high pressure. Oxygen, like most oxidizers, does not itself burn. However, it significantly increases the ease of ignition of other materials and the speed with which they burn. In a fire driven by pure oxygen, almost anything--including steel--will burn. Oxidizers must be kept away from combustible and flammable materials.

There are many materials that possess the ability to start a fire. As such, the source of a fire must first be determined before any attempt is made to extinguish it. Water should not be used to extinguish chemical fires for it might spread the fire or react with the material increasing the danger. Familiarize yourself with your fire response plan, the location of fire extinguishers in your area of responsibility and with their proper use, as you have been trained.

Reactive Materials

Reactive materials possess the second type of hazardous characteristic. Reactivity is the tendency of a substance to react with itself, air or water in a violent or hazardous manner. Although reactive chemicals are rare outside of the laboratory, they may still be encountered in the waste-stream. Reactive materials include:

- Explosives
- Pyrophoric chemicals (ignite on contact with air)
- Peroxide-forming compounds (ether)
- Materials that ignite or emit flammable or poisonous gases upon contact with water.

Pressure Hazards

Materials posing a pressure hazard possess the third hazardous characteristic. Pressure in gas cylinders may be as high as several thousand pounds per square inch. A broken valve or ruptured cylinder can cause the cylinder to rocket under the force of this pressure. In addition, compressed gases may pose other physical or health hazards; the nature of these will depend on the particular gas. Gas cylinders must be handled carefully when removing them from the waste stream.

Corrosive and Toxic Materials

Corrosive and toxic materials possess the fourth and fifth hazardous property respectively. The DOT corrosive label is required on the outer shipping container of most corrosives such as hydrochloric acid. Any item marked with this label is capable of causing serious chemical burns. Statements such as "Danger! Causes severe burns" alerts you to the fact that you are dealing with a corrosive. Toxic materials are those substances with potential to cause damage to human tissues and/or systems if they gain entry into the body. Health hazards of toxic materials are a determined by the chemical itself and by the way in which it is used.

Regardless of the toxicity of a chemical or material, it can harm us only if it can get on or into our bodies. Health hazards of toxic materials may be local, meaning they act only at the point of contact, or they can be systemic causing damage to the inner systems of the body.

Local effects of toxic substances include skin irritation and tissue corrosion. Irritation occurs when a chemical damages the outer layers of the skin. Although this damage is usually less severe than that of tissue corrosion, severe chemical irritation can be painful and also result in significant skin rash, blisters or other blemishes. These may be similar to the symptoms produced from contact with poison ivy. Some chemical irritations have an allergic basis so that different people will respond very differently to the same exposure. Most solvents, oils and petroleum products can cause skin irritation if contact is prolonged and repeated. Some polyurethane paints can cause severe irritation after short exposures. Paint removers containing muriatic and cresylic acid are examples of corrosive materials that actually dissolve and destroy human tissue.

The systemic effects of toxic materials can be divided into two categories—acute and chronic. Acute effects occur shortly after exposure to a chemical and can vary from minor irritation to sudden death. Chronic effects are those causing serious health problems after a delay of months or years. Examples of these chronic effects are the nervous system damage produced by mercury and its compounds and asbestos manifesting itself in lung cancer.

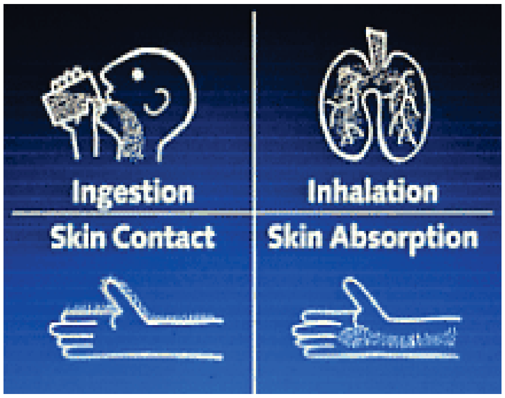
Identifying Toxic Substances

It is not possible to describe all toxic effects of every chemical, however, some general information concerning toxic materials is provided. Firstly, the DOT poison label is required on the shipping containers of very poisonous materials. Secondly, there is a pattern to the words used for the toxic warning statements on chemical labels. The labels can contain any or all of the following *"signal"* words:

- Caution
- Warning
- Danger

The toxic hazard is least for materials marked *"Caution"*, higher for material marked *"Warning,"* and greatest for those marked *"Danger."* Labels of moderately toxic materials that may read, *"Caution--Harmful if swallowed,"* while extremely toxic materials have more emphatic admonitions such as, *"Warning--Harmful or fatal if swallowed or inhaled."*

Routes of Exposure



As previously mentioned, materials cannot exert toxic effects unless they are absorbed into the body. There are three routes of entry through which toxic substances gain access to the body that include:

- Ingestion
- Inhalation
- Skin contact and absorption

Caution and common sense will help avoid exposure to chemicals. Hand washing is the best defense against ingesting of chemicals. Therefore, it is essential to wash one's hands after working with toxic materials and always before eating or smoking. Chemicals can be introduced directly into the bloodstream through contamination of wounds. Open cuts and broken skin should therefore be covered and protected when working. This highlights the necessity of wearing appropriate protective equipment when handling potentially hazardous materials. At minimum, protective gloves, goggles and boots should be worn. Addition, the absence of chemical odor does not indicate the level of toxicity of a material in question. Some materials emit toxic vapors without any indication of an odor that are inhaled nevertheless.

First Aid for Toxic Exposure

First aid for Toxic Exposure includes but is not limited to the following:

- Fresh air for vapor exposure for vapor exposure, get to fresh air
- For skin exposure, flush with water (All employees should be familiar with the location of the eye wash and other wash facilities in their work area.)
- Seek medical attention immediately.
- Call *911* if loss of consciousness, severe wheezing or other serious symptoms occurs.

Additional Waste Hazards

In addition to the hazards described above, employees may encounter waste materials posing risk of infection if improperly handled. Although regulated medical waste is not accepted at SPSA facilities, materials such as needles and other items containing blood borne pathogens routinely end up in the waste stream. Whether or not such material is regulated by a government authority has no impact on its ability to transmit infections or disease. Therefore, *extreme caution* must be exercised in the handling of solid waste. In fact, employees should avoid handling solid waste was much as possible. Institutional infectious wastes are easily identified by the special bags are used for their disposal. Infectious waste must be appropriately treated and rendered innocuous before. Untreated infectious waste in red bags is not acceptable. However, this does not preclude individuals from disposing in their household trash. It should therefore be assumed that all solid waste potentially contains infectious waste materials.

There are other waste materials whose presence is rare in solid waste but require precautions nonetheless. These include explosives and radioactive materials, which are recognized by their respective warning symbols. Only trained personnel should move these wastes.

Responding to Potentially Hazardous Waste

As supervisors/designated responders, you will be called upon to make investigations concerning waste received. Employees will look to you for guidance when a questionable material is spotted. When called upon in this manner, your role is to assess the situation and gather information. You are not expected to personally handle potentially hazardous waste. Instead, your role is to identify potentially hazardous materials, minimize risk of exposure to employees and citizens, and to contact the appropriate response personnel.

Never approach a suspicious material without proper personal protective equipment. If it can be determined that the suspect waste is not hazardous without handling it, normal operations can resume. However, if there is any uncertainty about the nature of the suspect material, implement established response procedures.

Appendix E
APPLICATION FOR DISPOSAL OF SPECIAL WASTE

Date: ___________________________

Applicant's Name: ____

Address: ____

City/State/Zip Code: ____

Contact Name: ____ Title: ____________________________

Phone: ____ Email: ___________________________________

Is applicant the waste generator? Yes ___________ No _______________

If no, provide name, address and contact for the waste generator below.

Generator's Name: ____
Address: ____
Contact: ____________________________________ Phone: ____________________________

Description of Special Waste

Identify waste (include chemical names if applicable): ____

____

Origin of Waste (Address): ____

Source of Waste (Describe process): ____

____

Frequency of Disposal (Circle one): One-time Ongoing

If ongoing, how often? (Circle one): Daily Weekly Monthly Quarterly Other

Transporter Name: ____
Transporter Contact: ____ Phone: _________________________

Please note the following waste acceptance criteria:

1. Special wastes are accepted for disposal at **SPSA's Regional Landfill** only.
2. Hazardous waste, regulated medical waste, PCB waste and other unauthorized waste are **not** accepted for disposal at any SPSA facility.
3. Special waste may require prior approval from the Department of Environmental Quality.
4. If required, reports of analysis of the waste material must accompany this application.
5. SPSA reserves the right to reject any waste not meeting its criteria for acceptance.
6. Knowingly disposing of hazardous or regulated waste in an improper manner is illegal and is punishable by fines or imprisonment.

I have read and understood the above waste acceptance criteria and I hereby certify that the waste covered by this application is not a hazardous waste, regulated medical waste, or an otherwise unauthorized waste.

Applicant Typed or Printed Name: ____

Applicant Signature: ____Date: ______________________

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Appendix F
Special/Industrial Waste Acceptance Criteria

SPSA closely monitors the types and amount of special/industrial waste disposed of at the Regional Landfill. The following criteria are used to determine the acceptability of special/industrial waste at the landfill. However, if it is determined by landfill or environmental staff that it is not at the best interest of SPSA to accept the waste, the application for disposal may be denied.

I. GENERAL LEVELS OF ACCEPTABILITY

A. TCLP (metals only)

Arsenic	5.0 ppm
Barium	100.0 ppm
Cadmium	1.0 ppm
Chromium	5.0 ppm
Lead	5.0 ppm
Mercury	0.2 ppm
Selenium	1.0 ppm

B. Corrosivity

pH between 2 and 12.5

C. Ignitability

Flashpoint not less than 140 degrees

D. Reactivity

Sulfide- no greater than 500 milligrams per kilogram
Cyanide- no greater than 250 milligrams per kilogram

E. Paint Filter Test

Negative result required to be deemed acceptable.

Acceptance Criteria for Specific Wastes

A. Auto Shredder Fluff

- Analysis for TCLP metals
- Analysis for PCBs

B. Empty Containers

1. Paint Cans (Unless disposed of at a SPSA HHW Facility – Residents Only)
   - Lids removed
   - No free liquid
   - Less than one inch dried residue

2. Drums
   - Steel drums must be empty, ends removed, and crushed. The crushed drums must no longer be capable of storing liquids or solids.

   - Plastic drums must be empty, have the ends cut out, and cut in quarters. Alternative means of cutting plastic drums may be evaluated on a case by case basis. All cutting methods must result in each drum being clearly identifiable as empty and no longer capable of holding liquids or solids.

3. Gas Cylinders (ALL)
   Must be delivered to a SPSA HHW Facility – Residents Only
   - Empty
   - Valve removed
   - Threads damaged to render non-useable

4. Aerosol Cans
   - Empty
   - Container punctured

5. Kegs
   - No beverage kegs are accepted at SPSA facilities

C. Incinerator Ash

- Medical Waste—Analysis for TCLP metals

D. Oily rags or other material contaminated with used oil

- No free liquid
- If incinerated—Total metals for arsenic, cadmium, chromium and lead, PCBs, Total Halogens and Flash point

E. Paint Waste (dried)

- Latex

    - MSDS
    - Oil
    - TCLP metals
    - MSDS

F. Pesticide Containers

- Contact SPSA Environmental Supervisor for acceptance procedures.

G. Petroleum Contaminated Soil and other Soils

Unless determined by Environmental Staff to be "Clean Fill", these requirements apply to ALL soils entering the Regional Landfill.

- SPSA may accept soil containing up to 500 ppm TPH, 10 ppm BTEX and 100 ppm TOX. Analyses will be required in compliance with the Soil Contaminated with Petroleum Products Guidelines set by the Department of Environmental Quality. SPSA Environmental Staff may require additional testing depending upon the origin of the soil. A site visit may be necessary to determine the acceptability for disposal.

H. Sandblast

- TCLP metals

I. Treated Wood

- Weathered only - no analysis required

J. Used Oil Filters

- Non-tern plated and gravity hot drained, no analysis required

K. Water Treatment Sludge

- Municipal WWT Sludge
    - Full TCLP
    - Paint filter test
    - TOX

Appendix G
Random Load Inspection Form

SPSA

LOAD CHECKING INSPECTION REPORT

Date: _____________ Time: _____________ Facility: ______________________________

Hauler: ____

Truck #: ______________ Box #: _______________ License Plate #: ___________________

Source of Waste: ____

Type of Waste: ____

☐ Driver waited Driver's Name: ________________________________

☐ Driver elected not to wait Driver's Signature: ______________________________

Is there unauthorized waste (hazardous waste, regulated medical waste, etc.) in the load?

☐ No. No further action necessary. Sign the form below.

☐ Yes. (Indicate type of waste.)

Type of Waste:

☐ Hazardous waste
☐ Regulated medical waste
☐ PCB waste
☐ Other ____

Description of Waste: ____

____

____

Actions Taken: ____

____

____

Inspected by: ______________________________ Date________________________

______________________________ Date: ________________________

Any waste suspected hazardous, regulated medical waste, PCB waste or otherwise unauthorized waste will be reported to the Virginia Department of Environmental Quality as required by law. Any questions concerning this matter should be directed to, Environmental Supervisor at (757) 418-3564.

EMS Form 29-Load Checking Inspection Form

Printed versions of EMS forms are uncontrolled. Check EMS website for latest revision before completing.

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ATTACHMENT II-2
LFG Management

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LANDFILL GAS MANAGEMENT PLAN

SPSA REGIONAL LANDFILL

PERMIT NO. 417

Submitted to:

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
Tidewater Regional Office
5636 Southern Boulevard
Virginia Beach, Virginia 23462

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, Virginia 23320

Prepared by:

HDR Engineering, Inc.
200 West Forsyth Street Suite 800
Jacksonville, Florida 32202

August 2008
Revised May 2010
Revised December 2010

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TABLE OF CONTENTS

SECTION PAGE

APPENDICES

A Drawing C-01, Perimeter Gas Probe Locations

Drawing C-02, Proposed Gas Well Layout

B Landfill Gas Collection and Control System Design Plan for the SPSA Regional Landfill, prepared by SCS Engineers, June 28, 2007

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SECTION 1.0

INTRODUCTION AND OBJECTIVES

This revised Landfill Gas Management Plan (Plan) has been prepared as part of the permit amendment for the Southeastern Public Service Authority (SPSA) Regional Landfill (Landfill) Solid Waste Permit No. 417. The Plan has been prepared in accordance with 9 VAC 20-80-280, Control of Decomposition Gases, which requires owners or operators to develop a landfill gas (LFG) management plan and implement a LFG monitoring program. Specifically, this plan has been developed following submission instructions No. 13 "Gas Management and Control System Facilities".

The objectives of this Plan are to develop and implement a cost-effective LFG management program, to provide a safe environment and to comply with the current applicable regulatory requirements. To achieve these objectives, the LFG management program will include the following approach.

- Design and install a LFG monitoring probe network along the perimeter of the Landfill (i.e. at the Facility Boundary) at select locations to detect potential off-site LFG migration.
- Monitor the LFG monitoring probe network in accordance with regulatory requirements and review the results to assess whether off-site LFG migration is occurring.
- Provide guidance and procedures in the event that methane concentrations above the regulatory limits are recorded.
- Design and install an active LFG extraction and control system.
- Monitor the LFG collection system in accordance with regulatory requirements and report these results as required per regulations.

The Landfill Gas Management Plan outlined herein will continue until the SPSA Regional Landfill receives written authorization to discontinue the program by the Virginia Department of Environmental Quality (VDEQ). Furthermore, if the LFG monitoring and control systems are modified to reflect changes at the site and/or adjacent land uses, the VDEQ will be duly notified, and documentation provided as necessary.

If the monitoring data suggests that a reduction of monitoring or control activities is warranted, the SPSA Regional Landfill will request a reduction of the monitoring or control activities. This request shall be submitted in writing to the VDEQ and this Plan will be updated and a permit amendment filed, as required.

SECTION 2.0

SITE DESCRIPTION/HISTORY

The SPSA Regional Landfill is located at 1 Bob Foeller Drive in Suffolk, Virginia, and began accepting municipal solid waste (MSW) in January 1985. The Landfill is part of an integrated solid waste management system that serves eight communities; the cities of Chesapeake, Suffolk, Norfolk, Portsmouth, Franklin, Virginia Beach, and the counties of Southampton and Isle of Wight. Surrounding the Landfill is the Great Dismal Swamp.

The Landfill includes two distinct disposal units, Cells I through IV and Cells V and VI. Cells I through IV make up a lined area consisting of approximately 103 acres which includes the oldest waste in place. These cells served as the primary location for waste disposal when the site opened in 1985. Cells I through IV were constructed with a 30-mil polyvinyl chloride (PVC) geomembrane liner and leachate collection system. Cells I through IV were closed in May 2009 and the post-closure period began September 2009.

Cells V and VI make up the second disposal unit encompassing approximately 85 acres. The base elevations of Cells V and VI were designed and constructed below the groundwater table. A groundwater extraction system has been installed to prevent additional stresses to the liner system due to hydraulic pressure under the liner. Cells V and VI are constructed with a double composite liner system using two high density polyethylene (HDPE) liners separated by a geosynthetic clay liner (GCL).

The Landfill is currently undergoing an application period for a lateral expansion into Cell VII. This landfill gas management plan has been revised to incorporate the changes which must occur assuming the approval of Cell VII. Cell VII has been designed in similar fashion to both Cells V and VI as it will be excavated below the seasonal high groundwater table. Again a double composite liner has been designed for this expansion.

The United States Environmental Protection Agency (EPA) promulgated the Standards of Performance for New Stationary Pollution Sources (NSPS) and Guidelines for Control of Existing Sources for municipal waste landfills in March 1996. The regulations require existing landfills (constructed prior to May 30, 1991) to meet the NSPS if the landfill design capacity is over 2.5 million megagrams (about 2.75 million tons) and the calculated Non-Methane Organic Compounds (NMOC) emission rate exceeds 50 megagrams (about 55 tons) per year. Any landfill meeting the criteria must install a gas collection system and a control device that complies with federal regulations. The control device can either be an open flare, an enclosed combustion device, or routed to a treatment system, which processes the collected gas for subsequent sale or use as per 40 CFR 60.752(b)(2)(iii)(c). The SPSA Regional Landfill meets the above criteria requiring the installation and operation of a landfill gas collection and control system.

As a result of the requirements of the landfill NSPS, a landfill gas to energy facility is operated using the gas extracted from Cells I through VI. The gas extracted from the cells is currently combusted by a third party as an offset for natural gas or is flared at the Landfill. As per the Landfill's Title V permit (Module II-Operations Plan, Appendix D), these control devices meet the requirements of NSPS regulations.

SECTION 3.0
GAS MONITORING

3.1 Facility Boundary Monitoring Network

The regulatory limit for methane concentrations at the Landfill Facility Boundary is 100 percent of the lower explosive limit (LEL), this is equivalent to 5.0 percent methane by volume and 25 percent of the LEL methane (or 1.25% methane by volume) in the facility or on offsite structures. Remedial efforts must begin if the methane concentrations at the Landfill Facility Boundary reach 80 percent of the LEL methane (or 4% methane by volume) or if the methane concentrations in the Landfill Facility structures or offsite structures reach the regulatory limit for structures (1.25% methane by volume). In order for a monitoring program to effectively evaluate compliance with this regulatory limit, a series of LFG monitoring probes are required along the LFG compliance boundary.

3.1.1 Monitoring Probe Locations

The Landfill has numerous LFG monitoring probes located at or near the facility boundary. These monitoring probes are shown on the attached Drawings C-01 (Appendix A). It should be noted that GP-31R and GP-23R will be abandoned and removed in accordance with VDEQ correspondence dated February 25, 2008 and will no longer be monitored for landfill gas. Due to this expansion, several perimeter methane monitoring probes will be abandoned as they no longer follow the perimeter of the waste footprint. These includes probes GP-28 and GP-29 which are located on the eastern boundary of Cell V, and monitoring probes GP-17 through GP-20 which are located in the easement between Cells I through IV and Cell V. To ensure that monitoring probes are located continuously around the new perimeter of the waste footprint, 10 new perimeter methane monitoring probes have been incorporated in the design for the Cell VII expansion. These new probes have been designed using a spacing of 500 feet as per Virginia Department of Environmental Quality previously approved methods. Spacing of the gas probes are strategically spaced around the perimeter of the Landfill (see Drawing C-02 in Appendix A). The most recent Design Report in Permit Module III and the current Operations Manual in Permit Module II of Solid Waste Permit No. 417 for the Landfill provide a more detailed explanation of the currently existing monitoring probe locations.

3.1.2 Depth and Monitoring Probe Construction

The depths and installation records of the current monitoring probe network are more detailed in the two previous Design Reports (Permit Module III) for the Landfill. In general the gas probe depths were determined by taking into account the local soil and rock conditions, as well as hydrogeological and hydraulic conditions surrounding the facility. The gas monitoring probes installed for Cell VI and designed for Cell VII include two gas probes at each monitoring location to measure different depths.

3.2 Structure Monitoring

All on-site structures at the site will be monitored on quarterly basis to confirm that combustible gas levels remain below the 25 percent LEL level. A gas monitor will be used to sample ambient air within structures. Special attention will be given to monitor crawl spaces, floor seams or cracks and subsurface utility connections. An effort will be made to monitor structures after they have been closed overnight. All readings are documented on SPSA's gas monitoring event log (Found in Appendix B of the Operations Manual in Permit Module II).

3.3 Monitored Parameters

The LFG monitoring network at the facility boundary will be monitored for the following parameters:

- methane (CH_4) in the percent LEL range and percent gas range.

The following parameters may be recorded for additional information:

- carbon dioxide (CO_2) in the percent gas range;
- balance gas which is typically nitrogen (N_2) in the percent gas range;
- oxygen (O_2) in the percent gas range; and
- barometric pressure in inches of mercury (in-Hg).

Other information such as date, time, atmospheric temperature, general weather conditions, and observations/comments will be recorded during each monitoring event on SPSA's gas monitoring event log (Found in Appendix B of the Operations Manual in Permit Module II).

3.4 Sampling and Analysis

Monitoring shall be performed with portable combustible gas field instrumentation, such as an Infrared Gas Analyzer, or other suitable instrument. The instrument's calibration will be checked prior to each monitoring event. A more detailed explanation is provided in 6.3.2 Sampling Equipment of the Design Report (Permit Module III).

3.5 Monitoring Frequency

Monitoring of the landfill gas probes will be conducted quarterly, which is the minimum requirement under 9 VAC 20-80-280 C 1. If methane levels exceed regulatory limits at the LFG monitoring network at anytime, a monthly monitoring schedule will be proposed to VDEQ and implemented, if site conditions require.

3.6 Response Requirements and Safety Precautions

In accordance with 9 VAC 20-80-280.E, the following actions will be taken in the event the gas monitoring results exceed applicable compliance levels.

- Take all immediate steps necessary to protect public health and safety including those required by the emergency plan.

- Notify the department in writing within five working days of learning that compliance levels have been exceeded, and indicate what has been done or is planned to be done to resolve the problem.
- Within 60 days of detection, implement a landfill gas remediation plan for the methane gas releases and submit it to VDEQ for approval and amendment of the facility permit. The plan shall describe the nature and extent of the problem and the proposed remedy.

The Landfill's current Operations Manual provides a more detailed explanation of the response requirements and safety precautions to be taken.

3.7 Recordkeeping

Each quarter, SPSA's staff produces a summary of the gas monitoring results for the previous quarter. The data is reported on SPSA's gas monitoring event log forms. These forms, along with any recommendations from the consultant, are maintained on file at the Regional Landfill as part of the Landfill's operating record during the active life, closure, and post-closure care period of the Landfill.

SECTION 4.0
EXTRACTION AND CONTROLS

The Regional Landfill currently has an active landfill gas extraction system in place. This extraction system consists of over 100 gas wells and other extraction points. A revised Landfill Gas Collection and Control System Design (GCCS) Plan was prepared by SCS Engineers on June 28, 2007 and submitted to SPSA and VDEQ. This plan is included in Appendix D.

This GCCS Plan addresses peak flow, general system design, grading, piping and the collection media. The revised GCCS Plan includes projected generation rates along with design calculations for the landfill gas collection system. Furthermore, this certified plan provides detailed landfill gas system drawings and typical surface emission monitoring route.

The landfill gas collection system controls landfill gas in one of three approved ways. The landfill gas is either used as fuel in the landfill gas to energy facility, piped to a local industry for use as fuel in their boilers or flared off at the landfill. Gas condensate generated and collected within Cells I-IV will be reintroduced back into Cells I-IV via knock-out pots and/or sumps within the disposal limits. In locations where gas condensate collected within the disposal limits cannot be reintroduced through knock-out pots and/or sumps, the gas condensate will be reintroduced into the leachate collection system.

Gas condensate generated and collected within Cells V-VII will be reintroduced back into Cells V-VII via knock-out pots and/or sumps within the disposal limits. In locations where gas condensate is collected outside the disposal limits it will be reintroduced into Cells V-VII via the leachate collection system, the working face, and/or one of the gas sumps/vertical wells/knock-out pots.

Gas condensate generated and collected at the gas plant will be reintroduced back into Cells V-VII via the leachate collection system, the working face, and/or one of the gas sumps/vertical wells.

A more detailed explanation is provided in the GCCS Plan, the Operations Manual and the Design Report for the Landfill.

SECTION 5.0

SPECIFICATIONS

Specifications of the gas management system and the gas control system are discussed in the GCCS Plan along with the Design Report. These specifications include materials of construction as well as methods employed to install the components.

SECTION 6.0

OPERATIONS AND MAINTENANCE

The landfill gas collection and control system is operated and maintained by a third party, US Energy and Biogas Corporation (US Energy). As such they maintain the records showing the gas extraction well network, servicing dates of the control systems, and operational records of the landfill gas extraction well field. On a regular basis US Energy provides operational records for Title V reports submitted to VDEQ. US Energy maintains a copy of the maintenance manual in their office.

SECTION 7.0

CONSTRUCTION QUALITY CONTROL

SPSA staff and US Energy staff will provide inspections, as needed, to ensure the integrity of the LFG Monitoring and Collection system. Prior to expansions of both networks, the designer will obtain and review all applicable test reports, shop drawings, and manufacturer's certificates to verify that the equipment used in the systems have been manufactured in accordance with industry standards.

SECTION 8.0

CLOSURE AND POST CLOSURE CARE

The gas monitoring and control program is designed to continue throughout the active life of the facility and the closure and post-closure care periods or until SPSA receives written authorization to discontinue by the DEQ. Authorization to cease gas monitoring and control will be dependent on a demonstration by SPSA that there is no potential for gas migration beyond the property boundary or into facility structures. Gas monitoring and control systems must be modified, during the closure and post-closure maintenance period, to reflect changing on-site and adjacent land uses. Post closure land use at the site must not interfere with the function of gas monitoring and control systems.

SECTION 9.0
REFERENCES

1. Virginia Solid Waste Management Regulations. 9 VAC 20-80-280.

2. Landfill Gas Collection and Control System Design Plan for the SPSA Regional Landfill. Prepared by SCS Engineers, June 28, 2007

3. USEPA. Standards for Performance for New Stationary Sources and Guidelines for Control Existing Sources – MSW Landfills. 40 CFR Part 60 Subpart WWW. January 1, 2007.

4. Cell VI Design Report for SPSA's Regional Landfill. Prepared by HDR Engineering, Inc., July 9, 2004 and revised September 19, 2007.

5. Operations Manual for SPSA's Regional Landfill. Revised November 2006

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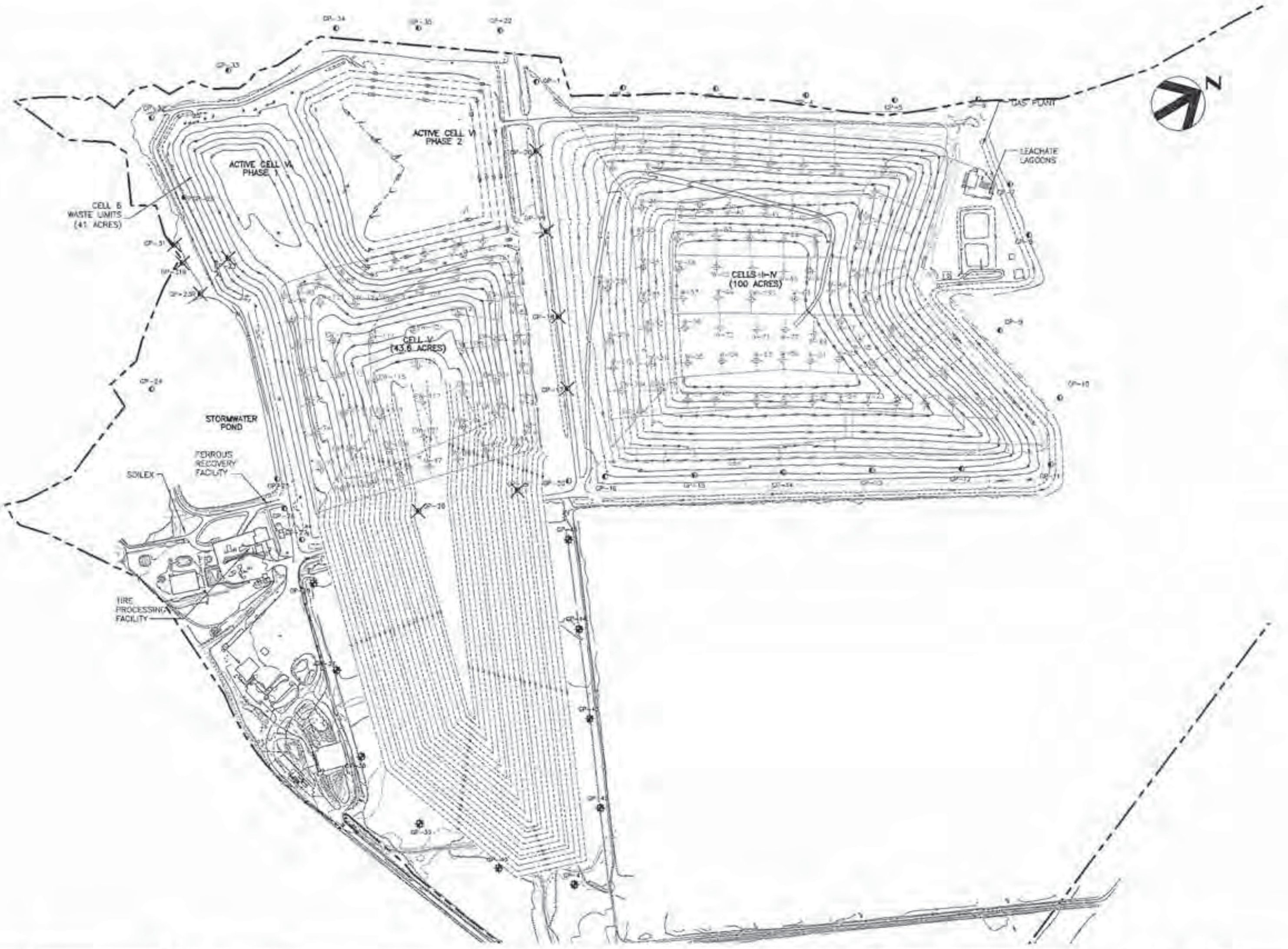
APPENDIX A

Drawing C-01, Perimeter Gas Probe Locations

Drawing C-02, Proposed Gas Well Layout



LEGEND

- ⊕ EXISTING GAS WELL
- ● EXISTING PERIMETER GAS PROBE
- ✕ EXISTING PERIMETER GAS PROBE (TO BE REMOVED)
- ✲ PROPOSED PERIMETER GAS PROBE
- —— EXISTING HDPE HEADER (SIZE VARIES)
- —— EXISTING HDPE LATERAL (SIZE VARIES)

NOTES

1. EXISTING TOPOGRAPHY SUPPLIED BY HURT AND PROFFIT, INC. FROM AERIAL PHOTOGRAPHY DATED ________
2. THE BUFFERS OUTLINED IN 9VAC 20-80-250 A(7) WILL BE MAINTAINED.
3. THE CONDITIONS SHOWN AS EXISTING ON THIS DRAWING REPRESENT GENERAL CONDITIONS AT THE TIME OF THE AERIAL PHOTOGRAPH DATED ________

HDR
HDR Engineering Inc. of the Carolinas
128 S Tryon Street, Suite 1400 | Charlotte, NC 28202

ISSUE	DATE	DESCRIPTION
A		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
DESIGNED	D.T. DECESARE, P.E.
DESIGNED	G.M. WILLIAMS, E.I.
DESIGNED	L. DAIGLE
CHECKED BY	C. LEBRON
DRAWN BY	D. SOSA
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill
Proposed Cell VII
Part B Application

SUFFOLK VIRGINIA

PERIMETER GAS PROBE LOCATIONS

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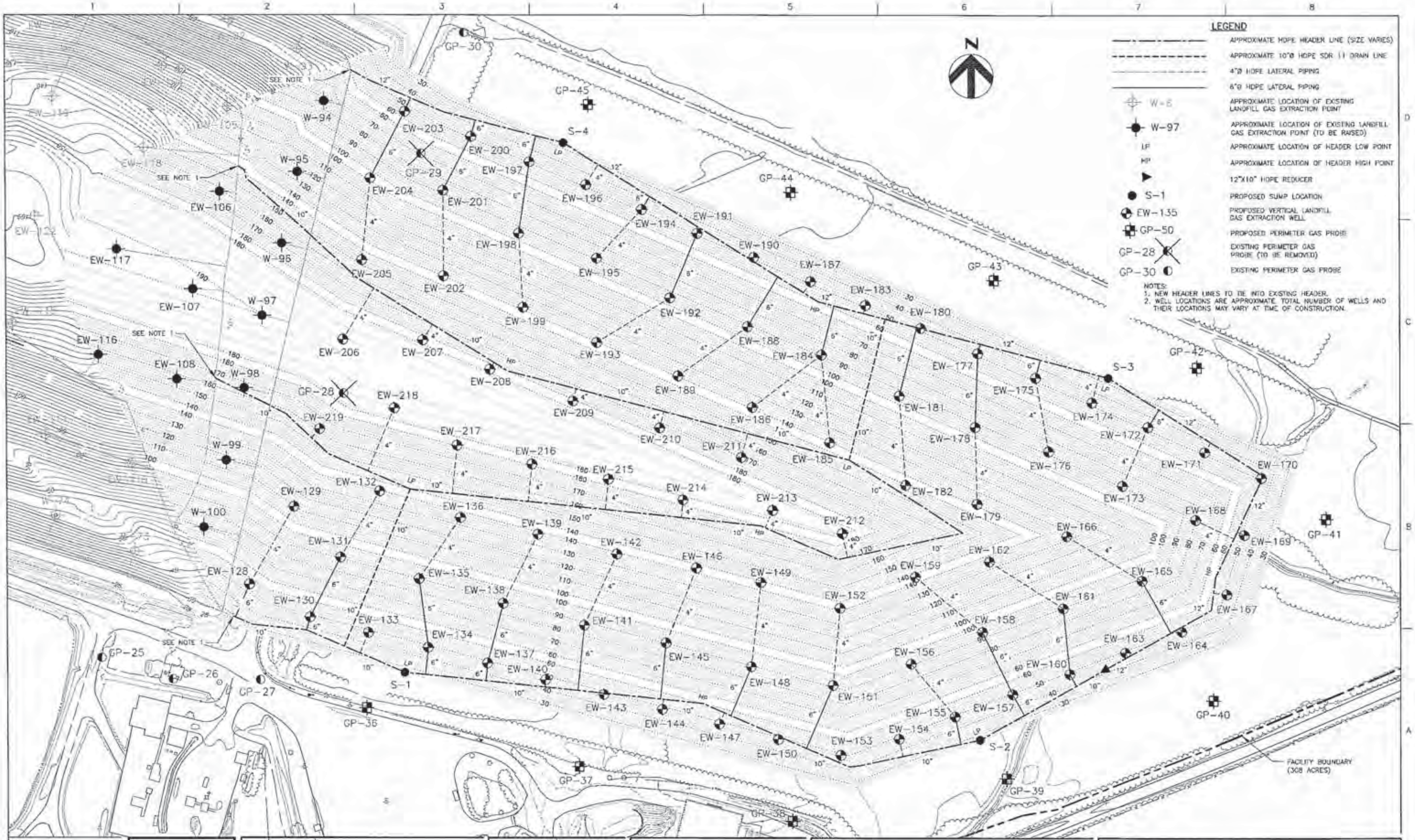
SCALE 1"=300'

SHEET C-01

C:\pwworking\tpa\vn\12569100C-01.dwg, Plot, 7/2/2008 3:31:13 PM, gwilliam, 1:2



NOTES:
1. NEW HEADER LINES TO TIE INTO EXISTING HEADER.
2. WELL LOCATIONS ARE APPROXIMATE. TOTAL NUMBER OF WELLS AND THEIR LOCATIONS MAY VARY AT TIME OF CONSTRUCTION.

HDR

HDR Engineering, Inc. of the Carolinas
128 S Tryon Street, Suite 1400 | Charlotte, NC 28202

ISSUE	DATE	DESCRIPTION
A		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
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DESIGNED	L. DAIGLE
CHECKED BY	C. LEBRON
DRAWN BY	D. SOSA
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill
Proposed Cell VII
Part B Application

SUFFOLK VIRGINIA

PROPOSED GAS WELL LAYOUT

0 1" 2"

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SCALE	1"=100'

SHEET
C-02

C:\PWworking\TPA\d0125691\00C-02.dwg, Plot, 7/2/2008 3:32:04 PM, gwilliam, 1:2

APPENDIX B

Landfill Gas Collection and Control System Design Plan for the SPSA Regional Landfill

prepared by SCS Engineers, June 28, 2007

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LANDFILL GAS COLLECTION AND CONTROL SYSTEM DESIGN PLAN FOR THE SPSA REGIONAL LANDFILL

SOLID WASTE PERMIT NO. 417
TITLE V PERMIT NO. 61341

SUFFOLK, VIRGINIA

Submitted to:

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
Tidewater Regional Office
5636 Southern Boulevard
Virginia Beach, Virginia 23462

Prepared for:

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
723 Woodlake Drive
Chesapeake, Virginia 23320
(757) 539-9373

Prepared by:

SCS ENGINEERS
3229 Anderson Highway
Suite 100
Powhatan, Virginia 23139
(804) 598-9480

Revised June 28, 2007
File No. 02201081.02-1

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Appendices

CERTIFICATION

I certify that the landfill gas collection and control system as described in this Plan meets the design requirements specified in 40 CFR 60.759 and any alternatives pursuant to 40 CFR 60.752(b)(2). The Plan is based on an original Design Plan developed by SCS Engineers, dated 6/6/03. The Plan has been amended by SCS Engineers to reflect the continued expansion of the landfill gas collection and control system in conjunction with continued landfill development. I further certify that this Plan was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the Commonwealth of Virginia.

Project: Landfill Gas Collection and Control System
SPSA Regional Landfill – Suffolk, Virginia

Robert E. Dick 6·28·07

Robert E. Dick, Virginia PE No. 024815 Date

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SECTION 1

INTRODUCTION

PURPOSE OF PLAN

On March 12, 1996, EPA promulgated the New Source Performance Standards (NSPS) and Emission Guidelines (EG) for new and existing landfills under Section III(b) of the Clean Air Act (CAA). The NSPS are intended to control Non-Methane Organic Compound (NMOC) emissions from municipal solid waste (MSW) landfills. The NSPS applies to landfills having a design capacity greater than 2,500,000 megagrams (Mg) and 2,500,000 cubic meters (m^3), which were permitted, modified, or reconstructed after May 30, 1991. Virginia has adopted this rule under 9 VAC 5-50-410.

Because the SPSA Regional Landfill in Suffolk, Virginia received a permit modification to increase design capacity after May 30, 1991 and has a total site design capacity greater than 2.5 million Mg and 2.5 million m^3, the Landfill is subject to the NSPS. In accordance with 40 CFR 60.754(a)(2)(ii), the Landfill calculated the NMOC emissions using the site-specific NMOC concentration obtained from Method 25C sampling conducted in March 1997 and February 2002.

Because the NMOC emission rate using the updated site-specific NMOC concentration exceeded the regulatory threshold of 50 Mg/yr, the Landfill was required to submit a collection and control system design plan prepared by a professional engineer to the Virginia Department of Environmental Quality (VDEQ) within 1 year.

The initial Landfill Gas (LFG) Collection and Control System Design Plan for the SPSA Regional Landfill (Solid Waste Permit No. 417) was prepared in accordance with 40 CFR 60.752(b)(2) and submitted to VDEQ for approval on June 6, 2003. The Plan has been revised by SCS Engineers to incorporate continued expansion and modification of the LFG collection and control system in conjunction with development of the landfill waste disposal units. This updated Plan satisfies Condition III.E.1 of the Title V Air Operating Permit, which was issued to the Landfill effective November 28, 2002.

The objectives of this LFG Collection and Control System Design Plan (the Plan) are as follows:

- Describe the existing LFG collection and control systems operating at the site;
- Present the proposed approach for system expansion during continued landfill development;
- Verify that the existing system construction is well documented;
- Demonstrate system compliance with the NSPS design/operational requirements;
- Outline the existing and proposed monitoring program, as required by the NSPS,

including a surface emissions monitoring plan; and,

- Document proposed alternatives to the operational, monitoring, and reporting/record keeping requirements, where applicable.

A summary of the site-specific conditions addressing compliance with NSPS requirements pertaining to design criteria and specifications for LFG collection and control systems is presented in this updated Plan.

LANDFILL BACKGROUND

SPSA Regional Landfill was permitted to begin operation as a sanitary landfill in September 1983. The facility currently has a waste footprint encompassing approximately 187.6 acres on a 308-acre parcel. The site has served as a sanitary landfill for the cities of Suffolk, Chesapeake, Virginia Beach, Norfolk, Portsmouth, and Franklin, and the counties of Isle of Wight and Southampton since commencing waste placement in 1985.

Activities currently occurring at the Regional Landfill include: landfilling operations at the two permitted disposal areas; the collection of recyclables at a recycling drop-off center; a transfer station; a tire shredding operation; a petroleum contaminated soil bioremediation facility; recyclable processing at a ferrous metals recovery facility; and a landfill gas-to-energy facility. The sanitary landfill is currently permitted to accept household and commercial municipal solid waste, construction debris, and ash from the SPSA refuse derived fuel (RDF) power plant.

Landfill Cells I through IV have a total waste footprint of 103 acres. These Cells contains a single composite liner system, a leachate collection system, a groundwater underdrain system below the liner and an active gas collection system. Landfill scalehouse records indicate that as of January 1, 2007 this permitted area contained an estimated 6.27 million tons of refuse in-place. The area is currently undergoing closure in accordance with the VDEQ approved closure plan. Closure is projected for completion by March 11, 2009.

On March 4, 1994, the VDEQ issued a solid waste permit amendment to add an active LFG recovery and power generation system in Cells I through IV to the Permit and allow for a lateral expansion. The lateral expansion, referred to as Cell V, has a total waste footprint of 43.6 acres and a maximum design capacity of 6.2 million cubic yards, which equates to 4.6 million tons of refuse (assuming a compaction ratio of 1,475 pounds per cubic yard). Landfilling operations in Cell V commenced in May 2000. Landfill scalehouse records indicate that as of October 1, 2006 this permitted area contained the maximum design capacity of refuse in-place.

The Facility's solid waste permit was amended on 11/7/05 to add a new waste disposal area, identified as Cell VI, which consists of 41 acres and a maximum design capacity of 8.92 million cubic yards, which equates to 6.6 million tons of refuse. The addition of Cell VI, which began receiving waste July 2006, gives the facility a maximum design capacity of 27.3 million cubic yards or 20.15 million tons.

SPSA's Regional Landfill is used for disposal of non-processable solid waste from the transfer stations and the RDF Plant, as well as both non-processable and processable solid waste from the

City of Suffolk. The SPSA Suffolk Transfer Station at the Regional Landfill, separates non-processable and processable solid waste from Suffolk.

The organic fraction of the landfilled waste has been reduced coinciding with operations of the RDF waste-to-energy plant and the composting sites. In 1997, SPSA diverted the disposal of the RDF ash from the Virginia Beach Landfill No. 2 to the Regional Landfill in Suffolk. Since 1999, the ash has been permitted as an alternative daily cover in a 50-50 mixture with soil on the working face of the active cells.

LANDFILL GAS BACKGROUND

The LFG collection system operator (Gasco) is Suffolk Landfill Gas, LP, while the LFGE operator (Genco) is Suffolk Energy Partners, LP (both entities referred to as US Energy Biogas in this Plan). US Energy currently operates, maintains, and monitors the LFG collection and control system for SPSA and maintains records of operational and performance data. The LFG collection system installed in Cells I through IV is currently composed of 72 operational vertical extraction wells, 29 perimeter collection manholes and six condensate collection sumps. Collected LFG is routed to a common collection manifold and then distributed to the CIBA transmission pipeline, four engine gensets, and/or a utility flare.

The LFG collection system has been installed in phases. In 1992, a LFG odor control system was installed utilizing the existing perforated leachate collectors in Cells III and IV and a portable blower station to collect the LFG and deliver it to a utility flare. The leachate manholes on the west side of the landfill were outfitted with condensate drains, connection piping, and control valves and connected to a buried LFG header pipe.

The horizontal perforated leachate collection trenches are spaced at 160 feet and are situated above the liner system. The bottom of refuse in Cells III and IV is at an approximate elevation of 23 feet. The leachate collectors are not continuous through the boundary of the east and west cells.

In June 1994, a LFG collection system was installed in Cells I through IV for the purpose of providing fuel to the Facility. The system consisted of 26 LFG extraction wells, 8,000 linear feet of buried HDPE collection pipe, three condensate collection sumps.

During 1995 and 1996, SPSA’s placement of additional refuse lifts while reshaping the landfill sideslopes required that the 26 LFG wellheads and well riser pipes be extended. This also resulted in the LFG collection piping being inaccessible since it was now buried deep within the refuse. In 1997, US Energy abandoned the original header and lateral pipes and installed replacement HDPE piping. In 1998, an additional 8 vertical LFG extraction wells were installed and connected to the system, as well as two additional condensate traps.

The 34 vertical wells are configured in an exterior loop, the location of which generally coincides with the existing bench at elevation 120 feet. The wells are schedule 80 PVC and are equipped with a borehole bentonite plug, a PVC geomembrane seal, and a filter fabric backfill separator. The wellheads consist of schedule 80 PVC pipe, a flanged gate valve for flow control, a labcock valve monitoring port, and flexible PVC connection piping.

During 1999, 15 additional leachate manholes along the eastern slope of Cells I and II were connected to the system. One additional condensate collection sump and an additional 10,000 linear feet of buried HDPE collection piping were installed.

In October 2000, 48 additional and/or replacement LFG vertical extraction wells were installed at a depth of 80 to 100 feet and spaced 150 feet apart. These wells are equipped with 8-inch diameter SDR-11 HDPE pipe and a dual bentonite plug. The cumulative well depths equal 3,960 vertical feet. The additional wells were configured as an interior loop, the location of which generally coincides with the bench at elevation 170 feet. In August 2002, US Energy completed the connection of these additional wells and is capable of extracting gas from all components installed in Cells I through IV.

In July 2001, US Energy completed construction of a LFG transmission pipeline from the US Energy Plant located adjacent to the Landfill extending to CIBA Specialty Chemicals. The LFG is utilized as supplemental fuel for two retrofitted boilers to process steam. The pipeline spans 2.2 miles and is constructed of 14-inch SDR 21 HDPE pipe.

The LFG collection system was expanded into Cell V with 28 LFG extraction wells being installed in the Spring of 2005 and connected to the US Energy processing facility via buried LFG collection piping. The LFG recovered from Cell V is processed through the treatment system and transported off-site to CIBA via the transmission pipeline.

OBJECTIVES OF LANDFILL GAS SYSTEM

The objectives of the existing LFG system are as follows:

- Collect LFG generated at the site and transport the LFG to the landfill gas-to-energy (LFGE) facility;
- Control odors and subsurface LFG migration at the site;
- Control air emissions at the site in accordance with the NSPS, the Title V Permit, and the MACT Rule; and,
- Protect the landfill site during operation and construction activities. The control of LFG being generated at the site and operation of the LFGE facility is intended to provide a safe environment for the operations personnel, construction contractor, adjacent properties, and the general public.

SECTION 2

LANDFILL GAS COLLECTION AND CONTROL SYSTEM

The LFG collection and control system at the Landfill has been installed in phases by several contractors beginning in 1992, with substantial expansions having been completed as recently as 2005. The wellfield, blower/compressor station, electrical generation facility, transmission pipeline, and utility flare are currently operated by US Energy. The system as-built and current conditions, as described in previous documents, project files and interviews with project personnel, are summarized below.

PERIMETER LEACHATE MANHOLES

The initial LFG collection system at the Landfill was constructed using the leachate manholes along the western waste limits. The 14 leachate manholes were equipped with wellheads and modified to enable active extraction of LFG by SCS Field Services (SCS-FS) in 1992. The wellhead configuration, piping profiles, manhole dimensions, construction details, and other design specifications were included in the construction documents prepared by HDR Engineering, Inc. in April 1992. The LFG collected from these extraction features were initially transported via buried piping to a portable blower/flare station located adjacent to the leachate storage basin.

The 15 leachate manholes located along the eastern waste limits were modified in 1999 to enable LFG extraction, in general accordance with construction details shown on drawings prepared by SCS Engineers, dated August 1998.

Because of the configuration used to connect the leachate manholes, these extraction components are sensitive to the applied vacuum and contribute significant air infiltration. The potential to reconfigure the connection is not feasible and therefore, these extraction components will not be considered part of the NSPS-compliant LFG system.

The leachate cleanout and riser pipes for the leachate collection system in Cells V and VI may be connected to the LFG system for LFG extraction purposes at some future date. Because these pipes are at the edge of waste and serve the primary purpose of leachate management, these components will not be considered part of the NSPS-compliant LFG system.

VERTICAL EXTRACTION WELLS

The initial wellfield was constructed by SCS Field Services (SCS-FS) in 1994 and consisted of 26 extraction wells. The well locations and depths, construction details, and other wellfield design specifications were included in the construction documents prepared by Energy Tactics. The Phase I Construction Record Drawings prepared by SCS in October 1994 document the LFG wellfield as-built conditions.

The 24 remaining original LFG extraction wells (installed in 1994) are constructed using 6-inch diameter SCH 80 PVC well pipe, while the 48 existing LFG extraction wells installed in Cells I-IV in 2000 are constructed using 8-inch diameter SDR-11 HDPE well pipe inside a 36-inch diameter boring. The well depths vary according to the waste depth and well drilling is typically terminated at a depth that is roughly two-thirds of the total waste depth and well above the bottom liner system. The length of perforated pipe is generally two-thirds the well depth, although the perforated length was increased for deeper wells to avoid installation of long sections of solid pipe. For LFG extraction wells installed in 2000, the perforations were 3/4-inch diameter holes spaced vertically at 2-inches and circumferentially at 60^o. Several of the 1994 wells have been extended to accommodate placement of additional refuse lifts.

For wells constructed in 2000, copies of the boring logs are filed at the site. The well depths are provided in Appendix B. The log shows that the fill material around these wells consisted of clay backfill, two bentonite seals, and a filter pack of 1-inch to 2-inch washed stone.

The LFG collection system in Cell V was installed in March and April 2005 and currently consists of 28 vertical extraction wells and three condensate sumps. These wells were constructed using 8-inch diameter SDR-11 HDPE well pipe inside a 36-inch diameter boring. The well depths are documented on the boring logs filed at the site. The wells are connected via a network of buried collection piping and routed to a header that crosses the road and connects to the US Energy LFG Processing Facility. The LFG recovered from Cell V is processed through the treatment system and transported off-site to CIBA via the transmission pipeline.

Tables are provided in Appendix B presenting the calculated depths of wells and the depth of refuse at each well location. However, the names of wells in Cells I-IV have changed over the years and there are no records to correlate existing well installation information with the latest names of the LFG extraction wells. The “Depth of Well” table provides information on the installed depth of well with the well identification based on the names given at installation. The wells denoted in the GW series are wells installed in 2000 and the depth of well is based on their existing well logs. The wells denoted in the EW series are wells installed in 1994 and the depth of well is based on boring logs (assumes wells were installed over the entire length of the boring).

The current wellfield consists of a total of 77 wells that covers approximately 103 acres of the Cell I through IV waste footprint and 28 wells located along the lowest bench in Cell V. The average spacing between LFG extraction wells is around 200 feet. This spacing provides an overlap for the calculated radius of influence (ROI) from each adjacent well, assuming a minimum ROI equal to 116 feet. As shown in the typical calculations included in Appendix B, the existing well depths yield calculated ROIs greater than this minimum. A layout of the current and proposed wellfield is included in Appendix C.

Portions of the LFG extraction wells are equipped with Accu-flo wellheads as manufactured by Landtec. The Accu-flo wellheads include a gate valve to control flow and vacuum, monitoring ports on either side of the valve to measure LFG quality and pressures, a temperature gauge, and a pitot tube with static and impact pressure ports for flow measurement. The flexible piping between the wellhead and the collection pipe tie-in is intended to accommodate differential settlement in the vicinity of each well. The initial LFG wellfield was not equipped with Accu-flo wellheads, but are controlled by adjusting a valve located at the wellhead. Monitoring ports enable the operator to obtain LFG quality, temperature, and vacuum.

As landfilling operations continue at the site, the existing LFG wellfield will be expanded in the existing and future cells in accordance with the provisions of the NSPS. Expansion of the system is being implemented in accordance with the solid waste permit, specifically, drawings prepared by HDR. Additional vertical extraction wells and corresponding wellheads will be installed as part of such system expansion. The locations and depths of future wells will be determined based on site conditions and LFG collection and control requirements at the time of installation.

HORIZONTAL COLLECTORS

There are no horizontal collectors currently installed as part of the LFG collection system (other than the leachate collection pipes which discharge leachate and LFG into the perimeter manholes. As landfilling operations continue at the site, horizontal collectors may be installed as part of the LFG system expansion. The location of future collectors will be determined based on site conditions and LFG collection and control requirements at the time of installation.

LANDFILL GAS COLLECTION PIPING

The wellfield is connected to the LFGE facility via buried and abovegrade collection piping, which is mostly HDPE (some older portions are PVC). The pipe sizes range from 4-inch to 18-inch. The pipe sizing calculations are included in Appendix B and indicate that the main header pipes will need to be upgraded or supplemented as increased LFG recovery rates are realized at the site.

CONDENSATE MANAGEMENT

In addition to the self-draining condensate traps installed in Cells I-V, the collected LFG flows through an 18-inch condensate trap and then through several aboveground knockout tank.

LANDFILL GAS PROCESSING FACILITY

The LFG is processed at the LFGE facility as follows:

- 4-inch-thick stainless steel mesh filter
- 300-hp Hoffman blower compressing to 8 psi
- Amercool air-to-air heat exchanger
- Vanec condensate knockout tank
- 10-micron 4-inch-thick stainless steel mesh filter
- 200-hp Hoffman blower compressing to 22 psi
- Amercool air-to-air heat exchanger
- 10-micron 4-inch-thick stainless steel mesh filter
- Airtek 2,500 cfm refrigeration unit

The LFG is routed to one or more of the control devices. There is a recirculation loop which allows reprocessing of a portion of the LFG. Generally, the LFG is utilized in the LFGE facility, which has a capacity of 2,500 cfm. In the event, the LFG is greater than 2,500 cfm, then the flare station with a 1,500 cfm capacity can be utilized to combust the excess LFG. The combined capacity of the LFGE facility and the flare station is adequate for the current estimated maximum flow from the Landfill. Because the future LFG recovery rate is anticipated to increase in conjunction with expansion of the LFG collection system, additional capacity will be needed and larger capacity blowers will be installed to handle the flow and a larger flare station installed to combust the excess LFG.

LANDFILL GAS FLARE STATION

Generally all the LFG is utilized in the LFGE facility (comprised of the electrical generation facility and the boilers at CIBA Specialty Chemicals), however, the utility flare serves as a secondary control device. The flare station consists of a LFG Specialties, Inc. Flare, Model PCF1025I8, and a 1,500 scfm capacity blower.

SECTION 3

LANDFILL GAS GENERATION RATES

Landfill gas generation rates for the site have been estimated using the US EPA Landfill Gas Emissions Model (LandGEM) version 3.02. These calculated LFG projections were compared to the actual LFG recovery rates recorded by the LFG system operator to verify the model output is reasonable.

For purposes of sizing the LFG collection and control system, the LandGEM was used to calculate LFG generation rates for the Landfill. Supporting calculations and model printouts are included in Appendix A. The assumptions and criteria used for these computations were as follows:

- **Refuse Filling History:** Based on the waste receipt data obtained from the facility from 1985 through 2006, the refuse in-place as of 1/1/07 was 10.4 million tons or 9.47 million Mg. The tonnage breakdown by fill area is roughly 6.3 million tons in Cells I-IV and 4.17 million tons in Cell V and Cell VI. These tonnages represent MSW landfilled at the site and exclude inert (i.e., non-LFG producing) wastes, such as the RDF ash. Future waste acceptance rates are assumed to increase 1 percent per year (using 2006 as the baseline) until the current design capacity is achieved around 2015.

- **LFG Decay Rate Constant (k):** A k value of 0.06/yr was used. This value for k is higher than the value published in AP-42 (0.04 yr^{-1}), and is based on actual LFG recovery rates measured at the site and SCS' professional engineering experience.

- **Ultimate Methane Generation Potential (L_0):** The L_0 value of 100 m^3/Mg is equivalent to the value cited by EPA's Emission Factor Documentation for AP-42 and is in accordance with the NSPS for purposes of sizing the system.

- **Methane Content:** A methane content of 50 percent by volume was used to reflect the average value anticipated during the LFG system operating life. The field monitoring and sampling data obtained since start-up indicates average methane concentrations greater than 50 percent.

The resulting 2007 LFG generation rate for the combined waste disposal areas is 4,677 scfm, as shown in the model output included in Appendix A. The expected closure date of the SPSA Regional Landfill (Cells I through VI) is 2015. The estimated maximum LFG generation rate, which is anticipated to occur in 2016, is 6,686 cfm at 50 percent methane. This is the maximum LFG flowrate expected over the design life of the LFG collection and control system using the criteria and computations described above. Model outputs for the projected LFG generation rates attributed to Cells I through IV and Cells V through VI are presented in Appendix A.

The LFGE facility operator measures the amount of LFG collected at the blower/compressor station and routed to the various control devices. Historical data for 1999 through 2006 provided by the operator indicated the total LFG processed annually ranges between 1,800 and 2,800 scfm at 50 percent methane. The average composition of the LFG being collected is in the 50 to 55 percent range for methane, and less than 5 percent oxygen.

Based on the capacity of the wellfield, collection piping, condensate sumps, blower/compressor station, process equipment providing treatment, and control devices (engine gensets, transmission pipeline to boiler, and utility flare) currently installed, the existing LFG collection and control system is sized to handle the maximum anticipated LFG quantities. Additional collection and processing capacity will be added to the system, if needed, based on performance monitoring activities described in Section 4 and measurements of actual LFG production rates. At the discretion of the Landfill and LFGE operator, additional collection and/or processing capacity may be added at any time for purposes of energy recovery.

SECTION 4

NSPS MONITORING PLAN

EXISTING MONITORING AND TESTING

The LFG Specialties utility flare serves as the backup LFG control device and is located at the LFGE facility. The utility flare was designed in accordance with 40 CFR 60.18 as required by 60.752(b)(2)(iii)(A). This control device was tested to show compliance with 40 CFR 60.18 on 3/9/05. The test program was conducted within 180 days of the date for start-up of the NSPS-compliant LFG system and included the three parameters of exit velocity, heat content, and visible emissions per EPA Method 22.

The LFG collected at the LFGE facility is processed and undergoes treatment prior to being routed to the internal combustion engine gensets, the transmission pipeline to an industrial boiler, and/or the utility flare. The USEPA issued an Initial Performance Test Waiver for the site in correspondence, dated October 3, 2002. This Waiver documents that an initial performance test is not required for the engine gensets, the off-site industrial boiler, or other future energy recovery device since the processing of LFG at the LFGE facility satisfies the definition of treatment. Therefore, since an initial performance test is not included, the monitoring and recording of combustion temperatures at these control devices will not be performed since there is no benchmark temperature measured during such test to make a comparison.

The LFGE facility operator performs routine monitoring of the LFG collection system at the wellheads as well as various locations along the collection piping. Monitoring is performed using a Landtec GEM-500 or GEM-2000 Infrared Gas Analyzer or other suitable field instruments. Parameters measured during the monitoring activities currently include concentrations of methane, oxygen, vacuum/pressure, temperature, and flows on those wells which are equipped with the appropriate wellheads.

The LFGE facility operator performs various other non-NSPS related monitoring and testing in accordance with the Stationary Source Permit No. 61137.

WELLFIELD MONITORING

In accordance with 40 CFR 60.753, the collection system will be operated with negative pressure at each vertical extraction wellhead except if there is a fire (or increased well temperature) or if a geomembrane final cap has been installed or the well is decommissioned. Each interior wellhead in the collection system will be operated with a landfill gas temperature less than 55^{o}C, except for those wells for which a higher operating value (HOV) has been established and submitted to VDEQ for approval. Each interior wellhead will be operated with either a nitrogen level less than 20 percent or an oxygen level less than 5 percent. The nitrogen level is not currently measured by the system operator but may at some time in the future be measured using appropriate field instrumentation. The oxygen level is measured using the GEM meter using Method 3A. Future monitoring may utilize alternative appropriate field instrumentation.

A sampling port is installed at each wellhead and temperatures are obtained during data collection using the GEM. Pressure and temperatures are measured by the system operator using the GEM meter. Future monitoring may require the usage of other appropriate instrumentation. In order to comply with the above standards, the following monitoring will be performed by the operator as specified in 40 CFR 60.756:

- Monthly monitoring of the gauge pressure at each extraction wellhead;
- Monthly monitoring of nitrogen or oxygen concentration in the landfill gas; and,
- Monthly monitoring of temperature of the landfill gas.

In accordance with 40 CFR 60.755, if a positive pressure exists or a well exceeds the nitrogen or oxygen operating parameters, action will be initiated to correct the problem within five calendar days except for a fire or increased well temperature. If the problem cannot be remedied within 15 calendar days of the first measurement, the gas collection system will be expanded or an alternate corrective action implemented to correct the exceedance within 120 days of the initial occurrence of the problem, or according to an alternate timeline that has been submitted to VDEQ. In accordance with 60.755(a)(4), the Facility will not be required to expand the gas collection system during the initial 180 days after start-up of individual or series of new wells or collectors in response to exceedances for pressure, oxygen, nitrogen, or temperature.

The perimeter leachate collection manholes in Cells I-IV currently connected to the LFG collection system are not considered to be part of the NSPS-compliant system. Similarly, any connections to leachate cleanout pipes or sump riser pipes in Cells V-VI for purposes of LFG extraction will be considered supplemental components and will not be considered part of the NSPS-compliant system. Therefore, these extraction components are exempt from the monthly monitoring requirement as well as the operational standards from the NSPS noted above. The system operator will conduct monitoring and make adjustments to the wellhead valves at these features as necessary to control odors, migration, and fugitive emissions, but will not be required to operate and monitor per the NSPS provisions.

The LFG system operator’s existing wellfield monitoring program conforms to NSPS monitoring requirements. Specific field meters may be replaced, as improved technology becomes available. Records of the monitoring results will be maintained in accordance with the NSPS requirements at the site.

SURFACE EMISSIONS MONITORING

NSPS requires that the LFG collection system operate so methane concentration is less than 500 ppm above background concentrations at the surface of the landfill. In order to determine the background concentration, surface testing will be conducted near the landfill boundary. After the background concentration is determined, surface testing will be conducted by the Landfill throughout the collection area and along a pattern that traverses the landfill along the benches at approximately 30-meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as cracks in surface cover and distressed vegetation. The interim slopes on portions of the Cell VI waste footprint will be excluded from the monitoring activities, since these areas are not at final grade and have retained waste for less than 5 years.

Furthermore, the active working face, pathways transversed by heavy equipment to access daily cover stockpiles, areas of landfill undergoing closure activity, and a suitable buffer around such areas will be excluded for safety reasons. Since the location of these areas will change between each event, monitoring personnel will use their judgement and modify the route as necessary to avoid unsafe situations. The Drawings in Appendix D show the monitoring route for Cells I-IV and Cells V-VI. Those areas that are proposed to be excluded from the monitoring because of safety reasons, as cited in the NSPS, will change during each event. The areas of surface emissions monitoring will be adjusted as the LFG system is expanded in conjunction with continued landfilling operations at the site, in accordance with the schedule outlined herein.

Surface testing will be conducted on a quarterly basis using a Flame Ionization Detector (FID) to record methane concentrations. The background concentration will be determined by moving the probe inlet upwind and downwind near the boundary of the landfill at a distance of at least 30 meters from the perimeter wells. The probe inlet will be placed within 5 to 10 centimeters above ground. Monitoring will be performed during typical meteorological conditions. Although typical meteorological conditions are not specified in NSPS, conditions such as torrential rain or high winds will be avoided.

In order to comply with the NSPS requirements, readings of 500 ppm or more above the background concentrations will be recorded as a monitored exceedance. As noted in 60.755(c)(4), as long as the specified actions are taken, the exceedance will not be a violation of the operational requirements of 60.753(d).

For each exceedance, the location will be marked and recorded. Necessary changes to the cover or well system will be made, and the location will be re-monitored within 10 calendar days of the exceedance. If the location exceeds the criteria a second time, necessary changes will be made and the location will be re-monitored within 10 calendar days. Any location that initially showed exceedance but does not show exceedance in the 10-day re-monitoring period will be re-monitored one month from the initial exceedance. If the 1-month re-monitoring is the second exceedance within a quarterly period, necessary changes will be made and the location will be re-monitored within 10 calendar days. Any location that has three exceedances within a quarterly period will have a new well or other collection device installed or an alternate corrective action implemented within 120 calendar days of the initial exceedance or according to an alternate timeline that has been submitted to VDEQ.

Although the surface emissions monitoring route will include areas along the limits of waste in Cells I-VI and thereby include sample locations in the vicinity of the perimeter leachate collection manholes, the Landfill proposes not to attempt corrective actions per the NSPS for any exceedance location identified in this area until construction of the final cover system in Cells V-VI is completed. Attempts to improve cover integrity or make wellhead adjustments in an effort to correct an exceedance along the toe of waste will likely be unsuccessful until a final cap is installed.

The Landfill will implement a surface emissions monitoring program that conforms to NSPS monitoring requirements. Records of the monitoring results will be maintained in accordance with the NSPS requirements.

PERIMETER MONITORING

The Landfill monitors a total of 35 gas probes placed along the perimeter of the landfill area (See Appendix C for gas probe locations). The gas probes are monitored quarterly to determine levels of methane, carbon dioxide, and oxygen. Further information on the perimeter gas monitoring program is the Landfill's Operations Manual, Chapter 7, which is contained in the Solid Waste Facility Permit #417.

SECTION 5

LANDFILL GAS SYSTEM EXPANSION IN CELL V AND VI

The Landfill has almost 15 years of experience operating an active LFG system simultaneous with waste placement operations within the same fill area. One of the many lessons learned is that it is critical to locate vertical extraction wells along a bench in the waste at an established elevation once landfilling activities have moved to place lifts at higher elevations. Adherence to this sequence decreases the potential for LFG system damage and interruption due to operations and has been proven at this Landfill to better preserve the integrity of the LFG collection piping and long-term efficiency of the wellfield.

Expansion of the LFG collection system in Cell V and installation of the wellfield in Cell VI needs to be coordinated with the filling sequence that will involve the “piggyback” placement of waste on the western slope of Cell V. The Landfill and LFG system operator desire the maximum flexibility to utilize various approaches to recover LFG and control emissions from portions of the waste footprint that have not achieved final elevations. These approaches may include extending vertical wells as waste placement continues or installation and operation of sacrificial vertical wells, or deferring installation of wells until such time that final elevations have been achieved. The criteria that will govern which approach is implemented is the NSPS performance standard which states methane concentrations cannot exceed 500 ppm above background during the routine surface emissions monitoring events.

The configuration of Cells V and VI involves 4 benches positioned every 40 vertical feet and coinciding with elevations of 60 feet, 100 feet, 140 feet, and 180 feet. The 28 vertical extraction wells installed in Cell V in 2005 are located along the 60-foot bench. The Landfill plans to implement the following sequence and schedule for expanding the wellfield in Cell V:

- Install additional wells along the top interim slopes at locations that will eventually coincide with the 180-foot bench prior to December 31, 2007;

- The LFG collection system may be connected to existing leachate cleanout and/or riser pipes to supplement LFG recovery from this waste disposal unit;

- Installation of the wells that are proposed to be located along the 100-foot and 140-foot benches will be deferred until such time as the landfill operations have achieved final waste elevations and the benches are fully formed. This schedule extension is dependent on the Facility being in compliance with the 500 ppm performance standard as verified by surface emissions monitoring. The duration of this proposed alternate schedule will be limited such that the wells along these benches will be installed and operated no later than December 31, 2010.

- The existing wells along the west side of Cell V will be abandoned as the placement of additional waste within the “piggyback” area covers these components.

Furthermore, the Landfill is proposing an accelerated schedule for expansion of the active LFG collection system into Cell VI, rather than wait for the NSPS deadline of 5 years from date of initial waste placement for active cells as outlined in 40 CFR 60.753(a). Because the date of initial waste placement in Cell VIA was July 2006 and NSPS allows a period of 60 days once the waste is 5 years old to install the LFG extraction components, the NSPS deadline for operation of the LFG system in Cell VIA would be September 2011. Under the accelerated schedule proposed herein, the LFG collection system will be expanded into Cell VIA in 2010. The benches that are intended to be constructed every 40 vertical feet may or may not actually be formed when the wells are installed.

The Landfill plans to implement the following sequence and schedule for expanding the wellfield in Cell VI in accordance with a signed letter of agreement between SPSA and the DEQ dated June 10, 2010:

- Install vertical gas extraction wells in Cell VIA by October 2010.
- Expand the LFG system in Cell VI as the benches are completed before September 2011 or as odor issues require.
- The LFG system for Cell VIB will be installed no later than five years from the date of initial placement or March 2013 (waste filling began in January 2008) or as odor issues require.

Note that Cell VI was developed in phases. Therefore, installation of the LFG system in Cell VI will also be similarly constructed in phases. Connection of the leachate sideslope riser pipes located along the toe of slope in Cell VI to the LFG collection system using an appropriate wellhead connection has been done in order to facilitate LFG extraction from these leachate components and control odors. However, because these features are located at the perimeter of waste limits and must continue to function for leachate management, these features are not considered part of the NSPS-compliant LFG system.

SECTION 6

SUMMARY OF LANDFILL GAS SYSTEM ALTERNATIVE STANDARDS

This NSPS Design Plan for the landfill gas collection and control system at the SPSA Regional Landfill proposes alternates to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping, and/or reporting provisions of the NSPS. These alternatives include, but are not limited to, the following:

- The 29 leachate collection manholes in Cells I-IV, which are currently connected to the active LFG extraction system, are not considered part of the NSPS-compliant LFG system, as discussed in Section 2. These extraction components are not subject to the monitoring requirements or operational standards cited by NSPS, as discussed in Section 4.

- In the event that the leachate cleanout and/or riser pipes in Cells V and VI are connected to the active LFG extraction system at some future date, these features will not be considered part of the NSPS-compliant LFG system.

- The wellhead monitoring will establish alternate standards (higher operating values) at individual wellheads which exhibit temperatures above 131 degrees F and/or oxygen levels above 5 percent. Monitoring data at these wells indicating such conditions will not be considered an exceedance and will not necessitate corrective actions. The alternate operating standards will be documented in the semi-annual compliance reports.

- The wellhead monitoring will establish alternate standards (higher operating values) at individual wellheads which exhibit neutral or positive pressures in areas that have received a geomembrane or synthetic cover as a component in the final cap system. Monitoring data at these wells indicating such conditions will not be considered an exceedance and will not necessitate corrective actions. The higher operating values will be documented in the semi-annual compliance reports.

- Corrective actions for surface emissions monitoring exceedance locations along the perimeter of Cells I-IV, if any, will not be performed until the final cover system has been installed, as discussed in Section 4.

- The schedule for expanding the LFG collection system in Cell V and into Cell VI will depend on achieving an operations milestone involving waste placement elevations, as discussed in Section 5.

- The LFG control system satisfies the definition of treatment under NSPS, thus the control devices are not required to conduct an initial performance test, as discussed in Section 4.

- The LFG collection system will not be required to be expanded as a direct result of exceedances for pressure, oxygen, nitrogen, or temperature that are measured within the first 180 days after start-up of individual or series of extraction wells or collectors.

- In the event that individual extraction components are assessed to be marginal LFG producers, the LFG system operator may temporarily shutdown these features or otherwise place them in off-line status for evaluation purposes. They may be operated and/or monitored only on a periodic basis to evaluate whether LFG quality and flow improve to the extent that LFG extraction is warranted.

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APPENDIX A

PROJECTED LFG AND NMOC GENERATION RATES

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TABLE 1. LFG RECOVERY PROJECTION
SPSA Regional Landfill - Suffolk, VA

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	LFG Generation (scfm)	LFG Generation (m^3/min)	LFG Generation (Million ft^3/yr)	NMOC Generation Rates (tons/yr)	NMOC Generation Rates (Mg/yr)
1985	20,097	0	18,232	0	0	0.0	0	0.0	0.0
1986	74,678	20,097	67,747	18,232	14	0.4	8	0.2	0.2
1987	98,358	94,775	89,229	85,978	67	1.9	35	0.9	0.8
1988	679,859	193,133	616,758	175,207	133	3.8	70	1.8	1.7
1989	685,702	872,992	622,058	791,965	610	17.3	321	8.4	7.6
1990	608,533	1,558,694	552,052	1,414,023	1,064	30.1	559	14.6	13.3
1991	448,683	2,167,227	407,038	1,966,075	1,436	40.7	755	19.8	17.9
1992	397,972	2,615,910	361,034	2,373,114	1,673	47.4	879	23.0	20.9
1993	458,604	3,013,882	416,039	2,734,148	1,860	52.7	977	25.6	23.2
1994	440,966	3,472,486	400,038	3,150,186	2,078	58.9	1,092	28.6	25.9
1995	455,297	3,913,452	413,038	3,550,224	2,272	64.3	1,194	31.3	28.4
1996	340,646	4,368,749	309,029	3,963,262	2,465	69.8	1,295	33.9	30.8
1997	385,023	4,709,395	349,287	4,272,291	2,564	72.6	1,348	35.3	32.0
1998	394,026	5,094,418	357,454	4,621,578	2,690	76.2	1,414	37.0	33.6
1999	579,124	5,488,444	525,372	4,979,032	2,814	79.7	1,479	38.7	35.1
2000	546,511	6,067,568	495,786	5,504,405	3,063	86.7	1,610	42.2	38.2
2001	561,089	6,614,079	509,011	6,000,191	3,275	92.7	1,721	45.1	40.9
2002	479,778	7,175,168	435,247	6,509,203	3,485	98.7	1,832	48.0	43.5
2003	628,277	7,654,946	569,963	6,944,450	3,624	102.6	1,905	49.9	45.2
2004	736,796	8,283,223	668,410	7,514,413	3,861	109.3	2,030	53.1	48.2
2005	662,920	9,020,019	601,391	8,182,823	4,162	117.9	2,188	57.3	52.0
2006	756,285	9,682,939	686,090	8,784,214	4,393	124.4	2,309	60.4	54.8
2007	763,848	10,439,224	692,951	9,470,304	4,677	132.4	2,458	64.4	58.4
2008	771,486	11,203,072	699,881	10,163,255	4,949	140.2	2,601	68.1	61.8
2009	779,201	11,974,558	706,879	10,863,136	5,212	147.6	2,739	71.7	65.1
2010	786,993	12,753,759	713,948	11,570,015	5,464	154.7	2,872	75.2	68.2
2011	794,863	13,540,753	721,088	12,283,964	5,708	161.6	3,000	78.5	71.3
2012	802,812	14,335,616	728,299	13,005,051	5,942	168.3	3,123	81.8	74.2
2013	810,840	15,138,427	735,582	13,733,350	6,169	174.7	3,243	84.9	77.0
2014	818,948	15,949,267	742,937	14,468,931	6,388	180.9	3,358	87.9	79.8
2015	657,814	16,768,216	596,759	15,211,869	6,601	186.9	3,469	90.8	82.4
2016	0	17,426,030	0	15,808,627	6,686	189.3	3,514	92.0	83.5
2017	0	17,426,030	0	15,808,627	6,296	178.3	3,309	86.6	78.6
2018	0	17,426,030	0	15,808,627	5,930	167.9	3,117	81.6	74.0
2019	0	17,426,030	0	15,808,627	5,584	158.1	2,935	76.8	69.7
2020	0	17,426,030	0	15,808,627	5,259	148.9	2,764	72.4	65.7
2021	0	17,426,030	0	15,808,627	4,953	140.3	2,603	68.2	61.8
2022	0	17,426,030	0	15,808,627	4,665	132.1	2,452	64.2	58.2
2023	0	17,426,030	0	15,808,627	4,393	124.4	2,309	60.4	54.8
2024	0	17,426,030	0	15,808,627	4,137	117.1	2,174	56.9	51.6
2025	0	17,426,030	0	15,808,627	3,896	110.3	2,048	53.6	48.6
2026	0	17,426,030	0	15,808,627	3,669	103.9	1,929	50.5	45.8
2027	0	17,426,030	0	15,808,627	3,456	97.9	1,816	47.6	43.1
2028	0	17,426,030	0	15,808,627	3,254	92.2	1,710	44.8	40.6
2029	0	17,426,030	0	15,808,627	3,065	86.8	1,611	42.2	38.3
2030	0	17,426,030	0	15,808,627	2,886	81.7	1,517	39.7	36.0
2031	0	17,426,030	0	15,808,627	2,718	77.0	1,429	37.4	33.9
2032	0	17,426,030	0	15,808,627	2,560	72.5	1,346	35.2	32.0
2033	0	17,426,030	0	15,808,627	2,411	68.3	1,267	33.2	30.1
2034	0	17,426,030	0	15,808,627	2,270	64.3	1,193	31.2	28.3
2035	0	17,426,030	0	15,808,627	2,138	60.5	1,124	29.4	26.7

Methane Content of LFG Adjusted to: 50%
Selected Decay Rate Constant (k): 0.060
Selected Ultimate Methane Recovery Rate (Lo): 100 m^3/Mg = 3,204 cu ft/ton
NMOC Concentration in LFG: 234 ppmv as Hexane

TABLE 2. LFG RECOVERY PROJECTION
SPSA Regional Cells I-IV - Suffolk, VA

Year	Disposal Rate	Refuse In-Place	Disposal Rate	Refuse In-Place	LFG Generation			NMOC Generation Rates	NMOC Generation Rates
	(tons/yr)	(tons)	(Mg/yr)	(Mg)	(scfm)	(m^3/min)	$(Million\ ft^3/yr)$	(tons/yr)	(Mg/yr)
1985	20,097	0	18,232	0	0	0.0	0	0.0	0.0
1986	74,678	20,097	67,747	18,232	14	0.4	8	0.2	0.2
1987	98,358	94,775	89,229	85,978	67	1.9	35	0.9	0.8
1988	679,859	193,133	616,758	175,207	133	3.8	70	1.8	1.7
1989	685,702	872,992	622,058	791,965	610	17.3	321	8.4	7.6
1990	608,533	1,558,694	552,052	1,414,023	1,064	30.1	559	14.6	13.3
1991	448,683	2,167,227	407,038	1,966,075	1,436	40.7	755	19.8	17.9
1992	397,972	2,615,910	361,034	2,373,114	1,673	47.4	879	23.0	20.9
1993	458,604	3,013,882	416,039	2,734,148	1,860	52.7	977	25.6	23.2
1994	440,966	3,472,486	400,038	3,150,186	2,078	58.9	1,092	28.6	25.9
1995	455,297	3,913,452	413,038	3,550,224	2,272	64.3	1,194	31.3	28.4
1996	340,646	4,368,749	309,029	3,963,262	2,465	69.8	1,295	33.9	30.8
1997	385,023	4,709,395	349,287	4,272,291	2,564	72.6	1,348	35.3	32.0
1998	394,026	5,094,418	357,454	4,621,578	2,690	76.2	1,414	37.0	33.6
1999	579,124	5,488,444	525,372	4,979,032	2,814	79.7	1,479	38.7	35.1
2000	204,942	6,067,568	185,920	5,504,405	3,063	86.7	1,610	42.2	38.2
2001	0	6,272,510	0	5,690,325	3,031	85.8	1,593	41.7	37.8
2002	0	6,272,510	0	5,690,325	2,855	80.8	1,500	39.3	35.6
2003	0	6,272,510	0	5,690,325	2,689	76.1	1,413	37.0	33.6
2004	0	6,272,510	0	5,690,325	2,532	71.7	1,331	34.8	31.6
2005	0	6,272,510	0	5,690,325	2,385	67.5	1,253	32.8	29.8
2006	0	6,272,510	0	5,690,325	2,246	63.6	1,180	30.9	28.0
2007	0	6,272,510	0	5,690,325	2,115	59.9	1,112	29.1	26.4
2008	0	6,272,510	0	5,690,325	1,992	56.4	1,047	27.4	24.9
2009	0	6,272,510	0	5,690,325	1,876	53.1	986	25.8	23.4
2010	0	6,272,510	0	5,690,325	1,766	50.0	928	24.3	22.1
2011	0	6,272,510	0	5,690,325	1,664	47.1	874	22.9	20.8
2012	0	6,272,510	0	5,690,325	1,567	44.4	823	21.6	19.6
2013	0	6,272,510	0	5,690,325	1,476	41.8	776	20.3	18.4
2014	0	6,272,510	0	5,690,325	1,390	39.3	730	19.1	17.3
2015	0	6,272,510	0	5,690,325	1,309	37.1	688	18.0	16.3
2016	0	6,272,510	0	5,690,325	1,232	34.9	648	17.0	15.4
2017	0	6,272,510	0	5,690,325	1,161	32.9	610	16.0	14.5
2018	0	6,272,510	0	5,690,325	1,093	31.0	575	15.0	13.6
2019	0	6,272,510	0	5,690,325	1,029	29.2	541	14.2	12.9
2020	0	6,272,510	0	5,690,325	969	27.5	510	13.3	12.1
2021	0	6,272,510	0	5,690,325	913	25.9	480	12.6	11.4
2022	0	6,272,510	0	5,690,325	860	24.3	452	11.8	10.7
2023	0	6,272,510	0	5,690,325	810	22.9	426	11.1	10.1
2024	0	6,272,510	0	5,690,325	763	21.6	401	10.5	9.5
2025	0	6,272,510	0	5,690,325	718	20.3	377	9.9	9.0
2026	0	6,272,510	0	5,690,325	676	19.2	356	9.3	8.4
2027	0	6,272,510	0	5,690,325	637	18.0	335	8.8	8.0
2028	0	6,272,510	0	5,690,325	600	17.0	315	8.3	7.5
2029	0	6,272,510	0	5,690,325	565	16.0	297	7.8	7.1
2030	0	6,272,510	0	5,690,325	532	15.1	280	7.3	6.6
2031	0	6,272,510	0	5,690,325	501	14.2	263	6.9	6.3
2032	0	6,272,510	0	5,690,325	472	13.4	248	6.5	5.9
2033	0	6,272,510	0	5,690,325	444	12.6	234	6.1	5.5
2034	0	6,272,510	0	5,690,325	419	11.9	220	5.8	5.2
2035	0	6,272,510	0	5,690,325	394	11.2	207	5.4	4.9

Methane Content of LFG Adjusted to: 50%
Selected Decay Rate Constant (k): 0.060
Selected Ultimate Methane Recovery Rate (Lo): 100 m^3/Mg = 3,204 cu ft/ton
NMOC Concentration in LFG: 234 ppmv as Hexane

TABLE 3. LFG RECOVERY PROJECTION
SPSA Regional Cells V-VI - Suffolk, VA

Year	Disposal Rate	Refuse In-Place	Disposal Rate	Refuse In-Place	LFG Generation			NMOC Generation Rates	NMOC Generation Rates
	(tons/yr)	(tons)	(Mg/yr)	(Mg)	(scfm)	(m^3/min)	(Million ft^3/yr)	(tons/yr)	(Mg/yr)
2000	341,569	0	309,866	0	0	0.0	0	0.0	0.0
2001	561,089	341,569	509,011	309,866	244	6.9	128	3.4	3.0
2002	479,778	902,658	435,247	818,878	630	17.8	331	8.7	7.9
2003	628,277	1,382,436	569,963	1,254,125	936	26.5	492	12.9	11.7
2004	736,796	2,010,713	668,410	1,824,088	1,329	37.6	699	18.3	16.6
2005	662,920	2,747,509	601,391	2,492,498	1,778	50.3	934	24.5	22.2
2006	756,285	3,410,429	686,090	3,093,889	2,147	60.8	1,129	29.5	26.8
2007	763,848	4,166,714	692,951	3,779,979	2,562	72.5	1,347	35.3	32.0
2008	771,486	4,930,562	699,881	4,472,930	2,958	83.8	1,555	40.7	36.9
2009	779,201	5,702,048	706,879	5,172,811	3,336	94.5	1,753	45.9	41.6
2010	786,993	6,481,249	713,948	5,879,690	3,698	104.7	1,944	50.9	46.2
2011	794,863	7,268,243	721,088	6,593,638	4,044	114.5	2,125	55.6	50.5
2012	802,812	8,063,106	728,299	7,314,726	4,376	123.9	2,300	60.2	54.6
2013	810,840	8,865,917	735,582	8,043,025	4,694	132.9	2,467	64.6	58.6
2014	818,948	9,676,757	742,937	8,778,606	4,999	141.6	2,627	68.8	62.4
2015	657,814	10,495,706	596,759	9,521,544	5,292	149.9	2,782	72.8	66.1
2016	0	11,153,520	0	10,118,303	5,453	154.4	2,866	75.0	68.1
2017	0	11,153,520	0	10,118,303	5,136	145.4	2,699	70.7	64.1
2018	0	11,153,520	0	10,118,303	4,837	137.0	2,542	66.6	60.4
2019	0	11,153,520	0	10,118,303	4,555	129.0	2,394	62.7	56.9
2020	0	11,153,520	0	10,118,303	4,290	121.5	2,255	59.0	53.6
2021	0	11,153,520	0	10,118,303	4,040	114.4	2,123	55.6	50.4
2022	0	11,153,520	0	10,118,303	3,805	107.7	2,000	52.4	47.5
2023	0	11,153,520	0	10,118,303	3,583	101.5	1,883	49.3	44.7
2024	0	11,153,520	0	10,118,303	3,374	95.6	1,774	46.4	42.1
2025	0	11,153,520	0	10,118,303	3,178	90.0	1,670	43.7	39.7
2026	0	11,153,520	0	10,118,303	2,993	84.7	1,573	41.2	37.4
2027	0	11,153,520	0	10,118,303	2,819	79.8	1,481	38.8	35.2
2028	0	11,153,520	0	10,118,303	2,654	75.2	1,395	36.5	33.1
2029	0	11,153,520	0	10,118,303	2,500	70.8	1,314	34.4	31.2
2030	0	11,153,520	0	10,118,303	2,354	66.7	1,237	32.4	29.4
2031	0	11,153,520	0	10,118,303	2,217	62.8	1,165	30.5	27.7
2032	0	11,153,520	0	10,118,303	2,088	59.1	1,097	28.7	26.1
2033	0	11,153,520	0	10,118,303	1,966	55.7	1,034	27.1	24.5
2034	0	11,153,520	0	10,118,303	1,852	52.4	973	25.5	23.1
2035	0	11,153,520	0	10,118,303	1,744	49.4	917	24.0	21.8
2036	0	11,153,520	0	10,118,303	1,643	46.5	863	22.6	20.5
2037	0	11,153,520	0	10,118,303	1,547	43.8	813	21.3	19.3
2038	0	11,153,520	0	10,118,303	1,457	41.3	766	20.0	18.2
2039	0	11,153,520	0	10,118,303	1,372	38.8	721	18.9	17.1
2040	0	11,153,520	0	10,118,303	1,292	36.6	679	17.8	16.1
2041	0	11,153,520	0	10,118,303	1,217	34.5	640	16.7	15.2
2042	0	11,153,520	0	10,118,303	1,146	32.4	602	15.8	14.3
2043	0	11,153,520	0	10,118,303	1,079	30.6	567	14.9	13.5
2044	0	11,153,520	0	10,118,303	1,016	28.8	534	14.0	12.7
2045	0	11,153,520	0	10,118,303	957	27.1	503	13.2	11.9
2046	0	11,153,520	0	10,118,303	901	25.5	474	12.4	11.3
2047	0	11,153,520	0	10,118,303	849	24.0	446	11.7	10.6
2048	0	11,153,520	0	10,118,303	800	22.6	420	11.0	10.0
2049	0	11,153,520	0	10,118,303	753	21.3	396	10.4	9.4
2050	0	11,153,520	0	10,118,303	709	20.1	373	9.8	8.9

Methane Content of LFG Adjusted to:	50%		
Selected Decay Rate Constant (k):	0.060		
Selected Ultimate Methane Recovery Rate (Lo):	100	m^3/Mg =	3,204 cu ft/ton
NMOC Concentration in LFG:	234	ppmv as Hexane	

APPENDIX B

TYPICAL CALCULATIONS

SPSA REGIONAL LANDFILL - SUFFOLK, VIRGINIA
PIPE SIZE CALCULATIONS

Note: - This spreadsheet calculates pressure drops between nodes in a pipe network using the Spitzglass formula.
- Assumes collection piping is PE Pipe (SDR-17).

SCS ENGINEERS
Richmond, VA
Calculated by RED
6/28/2007

FROM	TO	BRANCH FLOW (cfm)	HEADER FLOW (cfm)	PIPE DIA (in)	VELOCITY (fpm)	LENGTH (ft)	CS^2	PRESS. DROP (in-wc)	DELTA P PER 100 FT (in-wc)
	Header Sizing Calculations (24" main header at maximum design flow)								
A	B	6686	6686	21.18	2733	1000	6,980,557	5.41	0.54
	Header Sizing Calculations (20" header at two-thirds maximum design flow)								
C	D	4458	4458	17.65	2624	1000	7,270,117	5.75	0.57
	Header Sizing Calculations (18" header at one-half maximum design flow)								
E	F	3343	3343	15.88	2431	1000	7,399,741	5.38	0.54
	Header Sizing Calculations (16" lateral at one-third maximum design flow)								
G	H	2229	2229	14.12	2050	1000	7,507,935	4.24	0.42
	Header Sizing Calculations (12" header at one-fourth maximum design flow)								
I	J	1672	1672	11.25	2422	1000	7,603,318	7.35	0.73
	Header Sizing Calculations (10" header at one-fifth maximum design flow)								
K	L	1337	1337	9.49	2722	1000	7,573,405	11.04	1.10
	Lateral Sizing Calculations (4" lateral with 3 wells, each at 30 cfm)								
M	N	90	90	3.97	1047	1000	6,220,689	4.75	0.48

SPSA REGIONAL LANDFILL - SUFFOLK, VIRGINIA
CELLS I-IV LFG EXTRACTION WELLS
DEPTH OF WELL

Well Identification	Depth of Well (ft)
GW-1	110
GW-2	104
GW-3	110
GW-4	110
GW-5	110
GW-6	110
GW-7	110
GW-8	110
GW-9	110
GW-10	110
GW-11	96
GW-12	94
GW-13	94
GW-14	74
GW-15	100
GW-16	62
GW-17	88
GW-18	90
GW-19	69
GW-20	80
GW-21	110
GW-22	110
GW-23	100
GW-24	79
GW-25	110
GW-26	104
GW-27	99
GW-28	85
GW-29	66
GW-30	66
GW-31	100
GW-32	100
GW-33	100
GW-34	63
GW-35	95
GW-36	62
GW-37	64
GW-38	62
GW-39	63
GW-40	63
GW-41	51
GW-42	48
GW-43	64
GW-44	56
GW-45	52
GW-46	64

SPSA REGIONAL LANDFILL - SUFFOLK, VIRGINIA
CELLS I-IV LFG EXTRACTION WELLS
DEPTH OF WELL

Well Identification	Depth of Well (ft)
GW-47	64
GW-48	64
EW-1	40
EW-2	35
EW-3	No well
EW-4	56
EW-5	56
EW-6	No well
EW-7	56
EW-8	56
EW-9	40
EW-10	No well
EW-11	No well
EW-12	41
EW-13	56
EW-14	56
EW-15	50
EW-16	44
EW-17	56
EW-18	56
EW-19	56
EW-20	56
EW-21	56
EW-22	56
EW-23	56
EW-24	56
EW-25	56
EW-26	56
EW-27	56
EW-28	56
EW-29	56
EW-30	56

Notes:
1. Well designations based on obsolete numbering systems. EW designations from 1994 well installation. GW designations from 2000 well installation.
2. No records that correlate old numbering systems with latest. Therefore, refuse depths can not be determined for these wells.
3. EW wells were installed before the vertical expansion of the landfill, therefore the present depths of these wells is more than what is shown in the table.
4. A number of EW wells were abandoned and replaced by GW wells. No records exist to stipulate which EW wells were replaced with which GW wells.
5. As noted in the table, four proposed EW wells were never installed.

SPSA REGIONAL LANDFILL CELLS V AND VI
LANDFILL GAS WELL SCHEDULE CALCULATIONS

Well ID	Quantity	Surface Elevation	Top of Liner Sys.	Bottom of Boring	Tot. Boring Depth	ROI	Well Spacing
Wells Located on 60' Bench	20	60	0	20	40	100	175
Wells Located on 100' Bench	21	100	0	33	67	135	225
Wells Located on 140' Bench	5	140	0	45	95	190	325
Wells Located on 180' Bench	8	180	0	60	120	240	415

Notes:
1. Surface elevation for the wells on the 60', 100', 140', and 180' benches based on proposed final grade contours.
2. Top of Liner is assumed to be at 0' mean sea level. (EL = 0')
3. Boring depth is equal to 2/3 of waste depth.
4. Radius of Influence (ROI) is equal to 2 times the well depth for the wells on the 180', 140', and 100' benches and 2.5 times the well depth for the 60' bench.
5. Well spacing is calculated by multiplying 1.73 times the radius of influence to allow for overlap and system coverage.

APPENDIX C

LFG SYSTEM DRAWINGS

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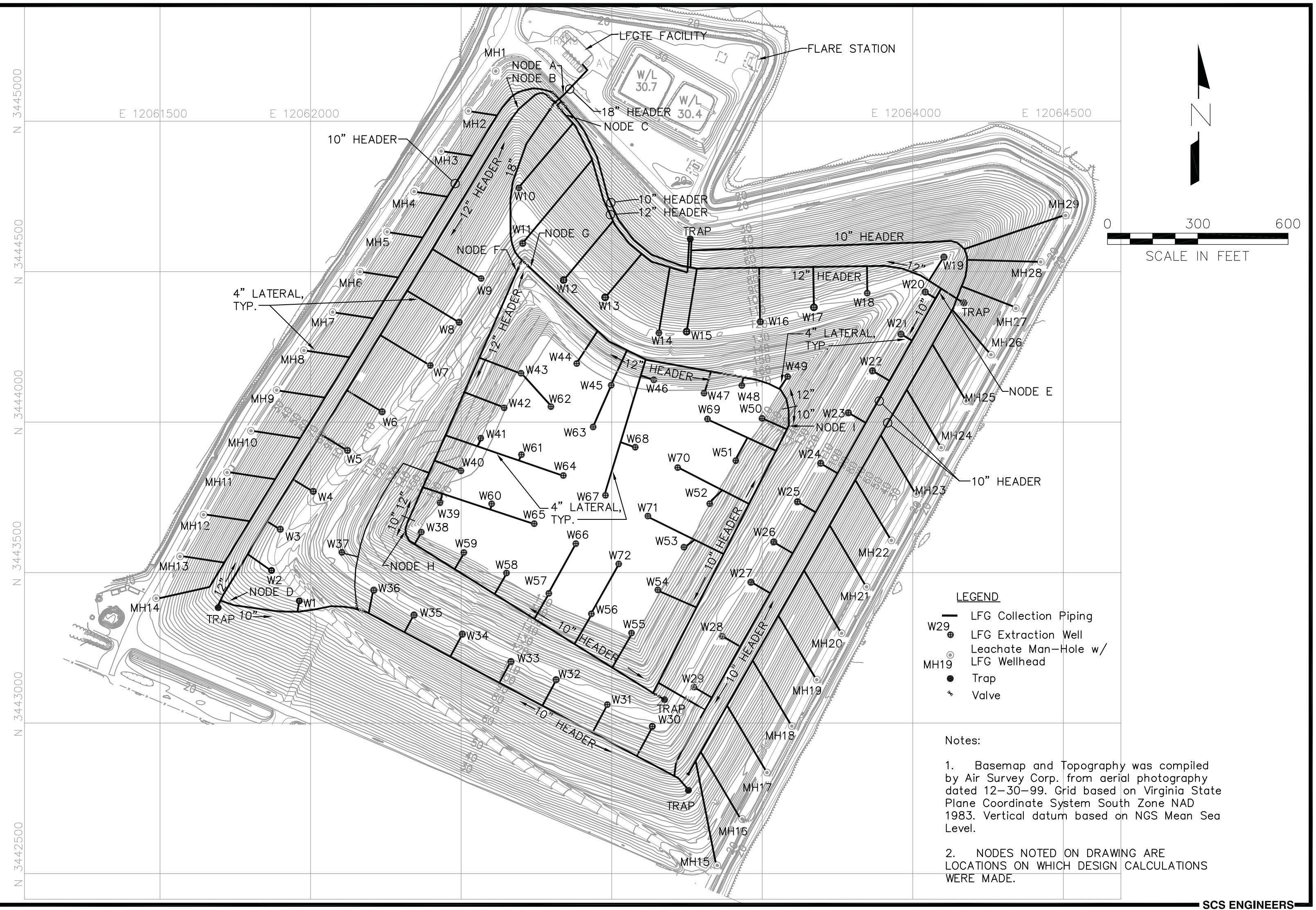


LEGEND

- LFG Collection Piping
- W29 ⊕ LFG Extraction Well
- MH19 ◎ Leachate Man-Hole w/ LFG Wellhead
- ● Trap
- Valve

Notes:

1. Basemap and Topography was compiled by Air Survey Corp. from aerial photography dated 12-30-99. Grid based on Virginia State Plane Coordinate System South Zone NAD 1983. Vertical datum based on NGS Mean Sea Level.

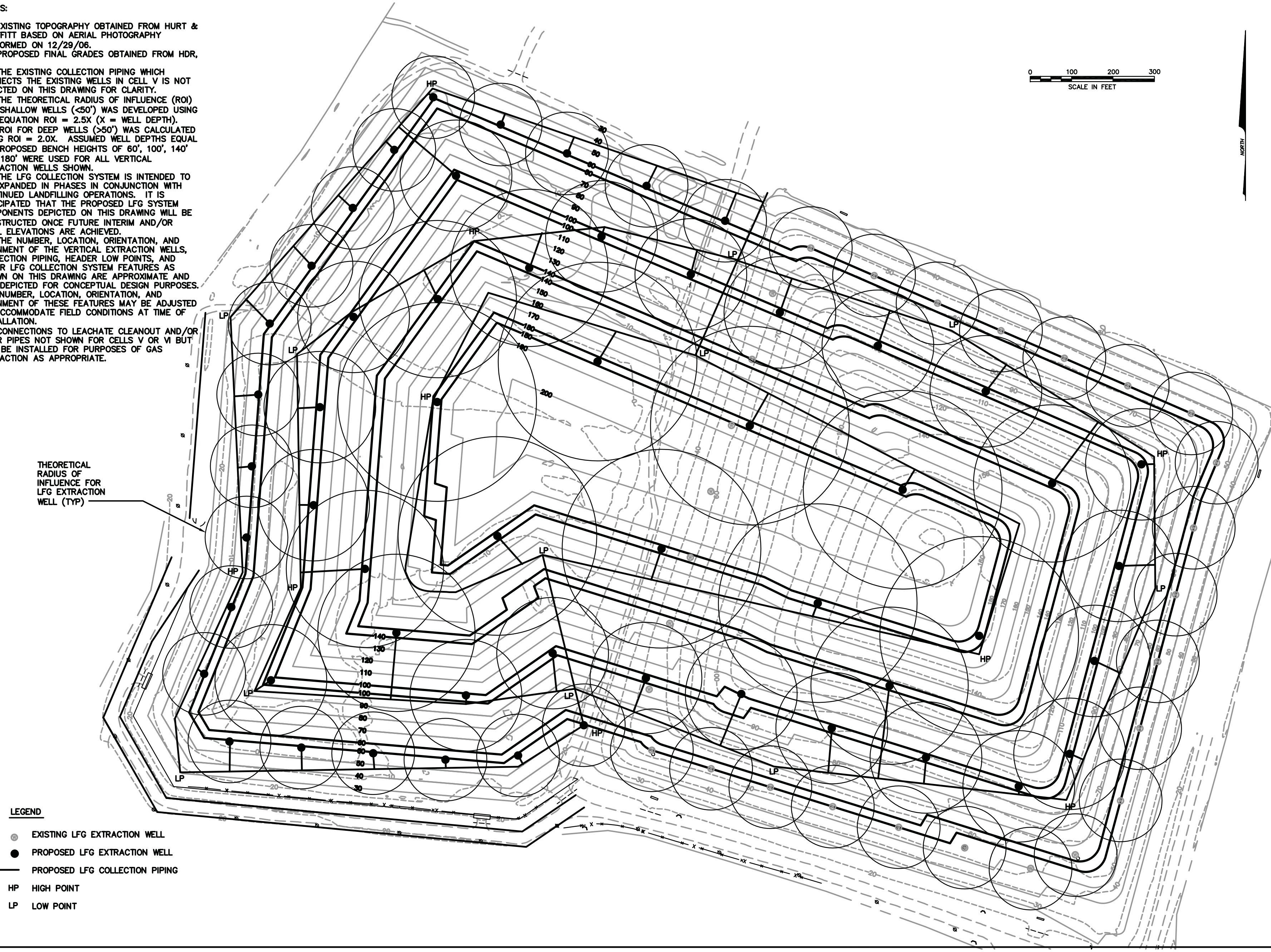
2. NODES NOTED ON DRAWING ARE LOCATIONS ON WHICH DESIGN CALCULATIONS WERE MADE.

SCS ENGINEERS

EXISTING LFG COLLECTION SYSTEM
SPSA REGIONAL LANDFILL - CELLS I-IV

NOTES:

1. EXISTING TOPOGRAPHY OBTAINED FROM HURT & PROFFITT BASED ON AERIAL PHOTOGRAPHY PERFORMED ON 12/29/06.
2. PROPOSED FINAL GRADES OBTAINED FROM HDR, INC.
3. THE EXISTING COLLECTION PIPING WHICH CONNECTS THE EXISTING WELLS IN CELL V IS NOT DEPICTED ON THIS DRAWING FOR CLARITY.
4. THE THEORETICAL RADIUS OF INFLUENCE (ROI) FOR SHALLOW WELLS (<50') WAS DEVELOPED USING THE EQUATION ROI = 2.5X (X = WELL DEPTH). THE ROI FOR DEEP WELLS (>50') WAS CALCULATED USING ROI = 2.0X. ASSUMED WELL DEPTHS EQUAL TO PROPOSED BENCH HEIGHTS OF 60', 100', 140' AND 180' WERE USED FOR ALL VERTICAL EXTRACTION WELLS SHOWN.
5. THE LFG COLLECTION SYSTEM IS INTENDED TO BE EXPANDED IN PHASES IN CONJUNCTION WITH CONTINUED LANDFILLING OPERATIONS. IT IS ANTICIPATED THAT THE PROPOSED LFG SYSTEM COMPONENTS DEPICTED ON THIS DRAWING WILL BE CONSTRUCTED ONCE FUTURE INTERIM AND/OR FINAL ELEVATIONS ARE ACHIEVED.
6. THE NUMBER, LOCATION, ORIENTATION, AND ALIGNMENT OF THE VERTICAL EXTRACTION WELLS, COLLECTION PIPING, HEADER LOW POINTS, AND OTHER LFG COLLECTION SYSTEM FEATURES AS SHOWN ON THIS DRAWING ARE APPROXIMATE AND ARE DEPICTED FOR CONCEPTUAL DESIGN PURPOSES. THE NUMBER, LOCATION, ORIENTATION, AND ALIGNMENT OF THESE FEATURES MAY BE ADJUSTED TO ACCOMMODATE FIELD CONDITIONS AT TIME OF INSTALLATION.
7. CONNECTIONS TO LEACHATE CLEANOUT AND/OR RISER PIPES NOT SHOWN FOR CELLS V OR VI BUT MAY BE INSTALLED FOR PURPOSES OF GAS EXTRACTION AS APPROPRIATE.



THEORETICAL RADIUS OF INFLUENCE FOR LFG EXTRACTION WELL (TYP)

LEGEND

◎	EXISTING LFG EXTRACTION WELL
●	PROPOSED LFG EXTRACTION WELL
—	PROPOSED LFG COLLECTION PIPING
HP	HIGH POINT
LP	LOW POINT

NO.	REVISION	DATE
△		
△		
△		
△		
△		

SHEET TITLE
LFG SYSTEM LAYOUT CELLS V-VI
FUTURE BUILD-OUT

PROJECT TITLE
CONCEPTUAL LFG SYSTEM
MASTERPLAN FOR GCCS DESIGN

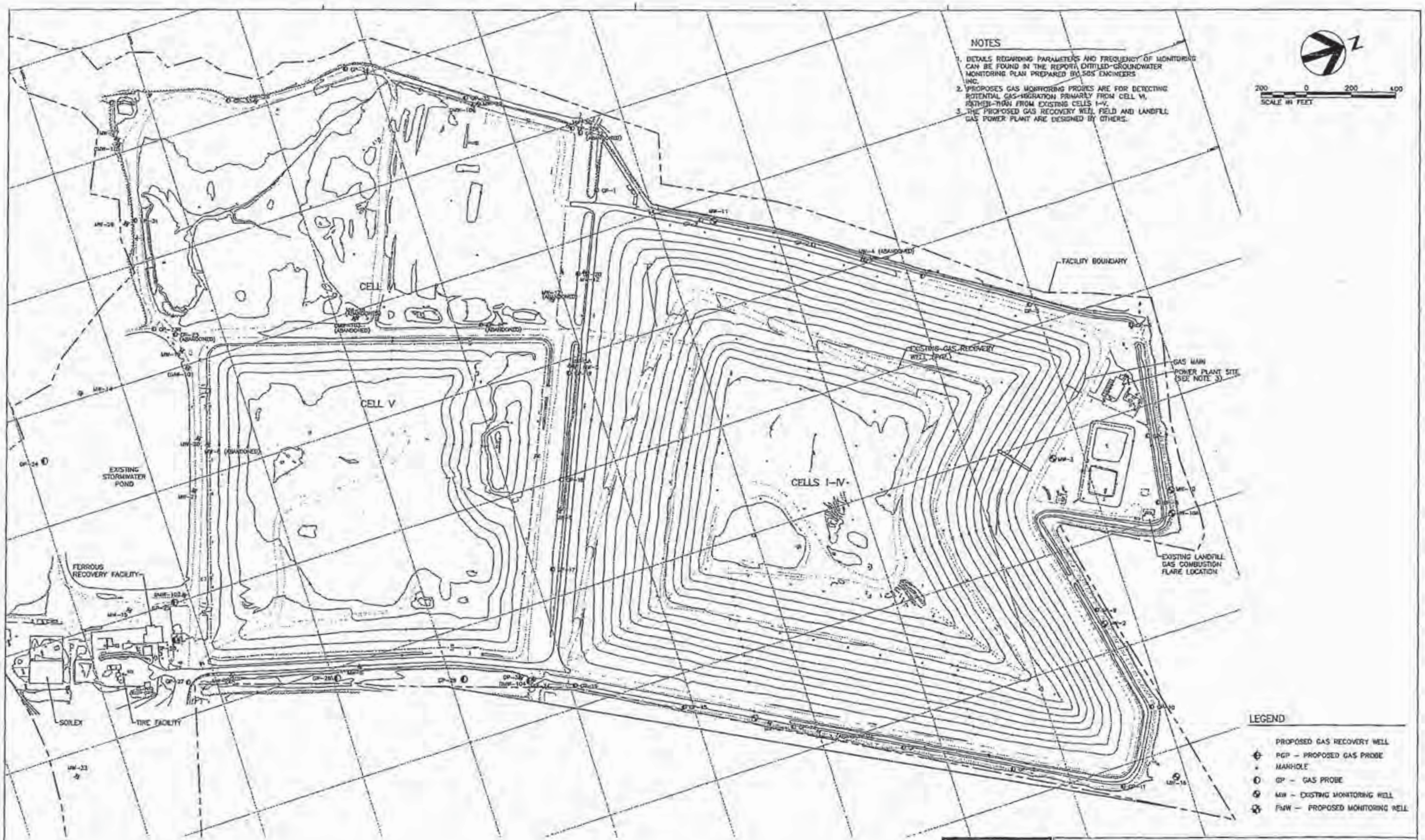
CLIENT
SOUTHEASTERN PUBLIC
SERVICE AUTHORITY
REGIONAL LANDFILL
SUFFOLK VIRGINIA

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
3229 ANDERSON HWY. #100 - POWHATAN, VA 23139
PH. (804) 598-9480 FAX. (804) 598-9485

PROJ. NO. 02201081.02
DSN. BY: GMW
DWN. BY: GMW
CHK. BY: RED
Q/A RVW BY:
APP. BY: RED

CADD FILE: GCCS PLAN
DATE: 6/28/07
SCALE: AS SHOWN
DRAWING NO. 1 of 1

M:\



NOTES

1. DETAILS REGARDING PARAMETERS AND FREQUENCY OF MONITORING CAN BE FOUND IN THE REPORT ENTITLED-GROUNDWATER MONITORING PLAN PREPARED BY SCS ENGINEERS INC.
2. PROPOSES GAS MONITORING PROBES ARE FOR DETECTING POTENTIAL GAS-MIGRATION PRIMARILY FROM CELL VI, RATHER-THAN FROM EXISTING CELLS I–V.
3. THE PROPOSED GAS RECOVERY WELL FIELD AND LANDFILL GAS POWER PLANT ARE DESIGNED BY OTHERS.

HDR
HDR Engineering, Inc.

SPSA REGIONAL LANDFILL CELL VI EXPANSION
REGIONAL SOLID WASTE AND
RESOURCE RECOVERY PROJECT
SITE PLAN AND
MONITORING WELL LOCATIONS

7/04

FIG.2

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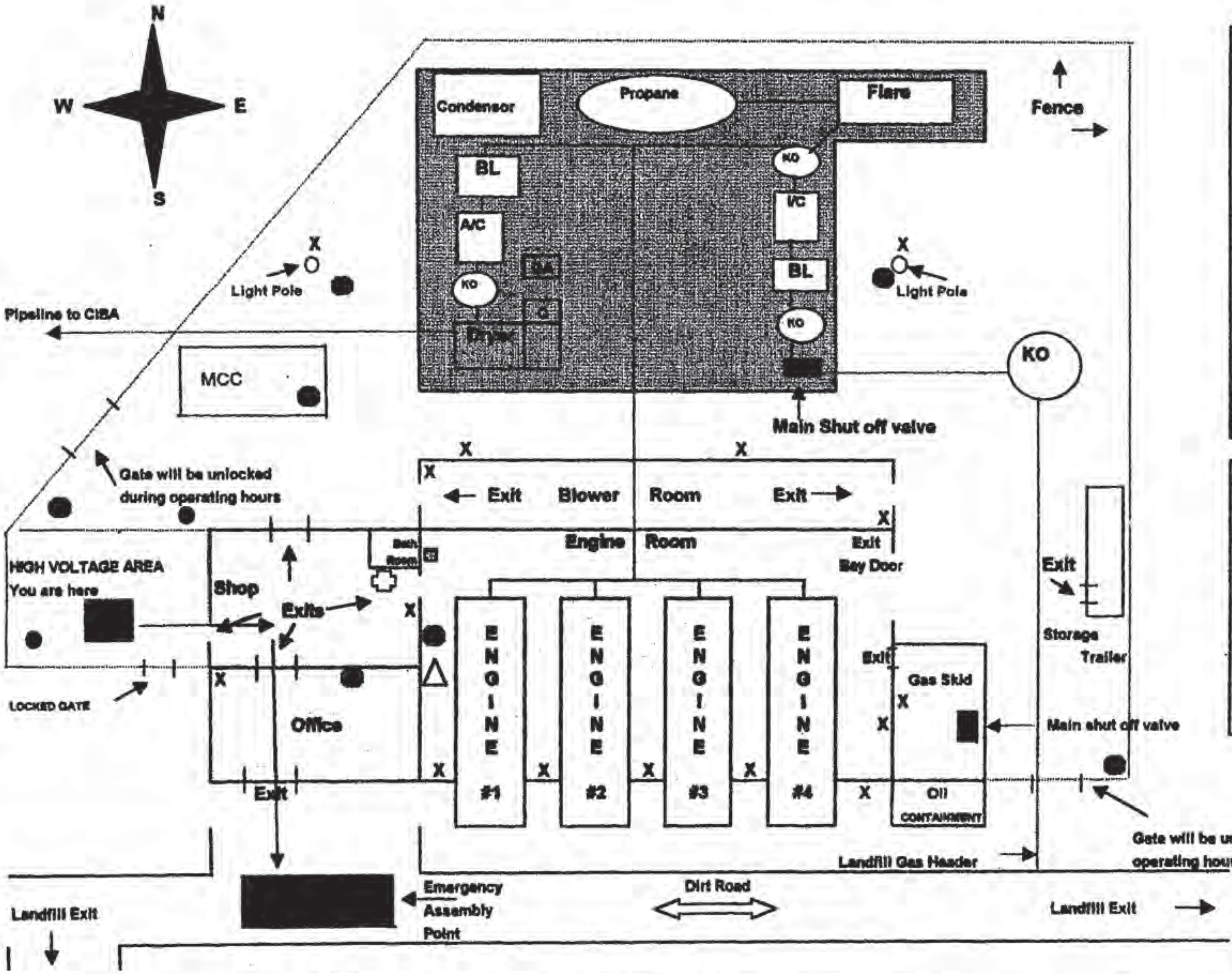
ZAPCO SPSA FACILITY EVACUATION PLAN



Legend

BL	Blower
A/C	After Cooler
KO	Knock Out
I/C	Inner Cooler
O	Odorizer
GA	Gas Analyzer
MCC	Motor Control Cabinet
●	Disconnect Switch
●	Emergency Stop
▬	Main Shut off valve
X	Fire Extinguisher
✚	PPE Station
▣	Eye Wash Station
Δ	Gas Detector Monitor
○	Light Pole
☐	Generation Facility
▨	Gas Processing Facility

EMERGENCY CALL TREE

POLICE		911
FIRE DEPT		911
Jamie Margaritis		
	Home	757 420-5822
	Pager	877 320-7153
	Cell	757 567-6578
Steve Laliberty		
	Cell	631 334 7308
Dominic Antignano		
	Cell	516 768-4124

IN THE EVENT OF AN EMERFGENCY, ALL EMPLOYEES SHOULD EXIT THE SITE VIA THE NEAREST EXIT AND MEET AT THE EMERGENCY ASSEMBLY POINT

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APPENDIX D

TYPICAL SURFACE EMISSIONS MONITORING ROUTE

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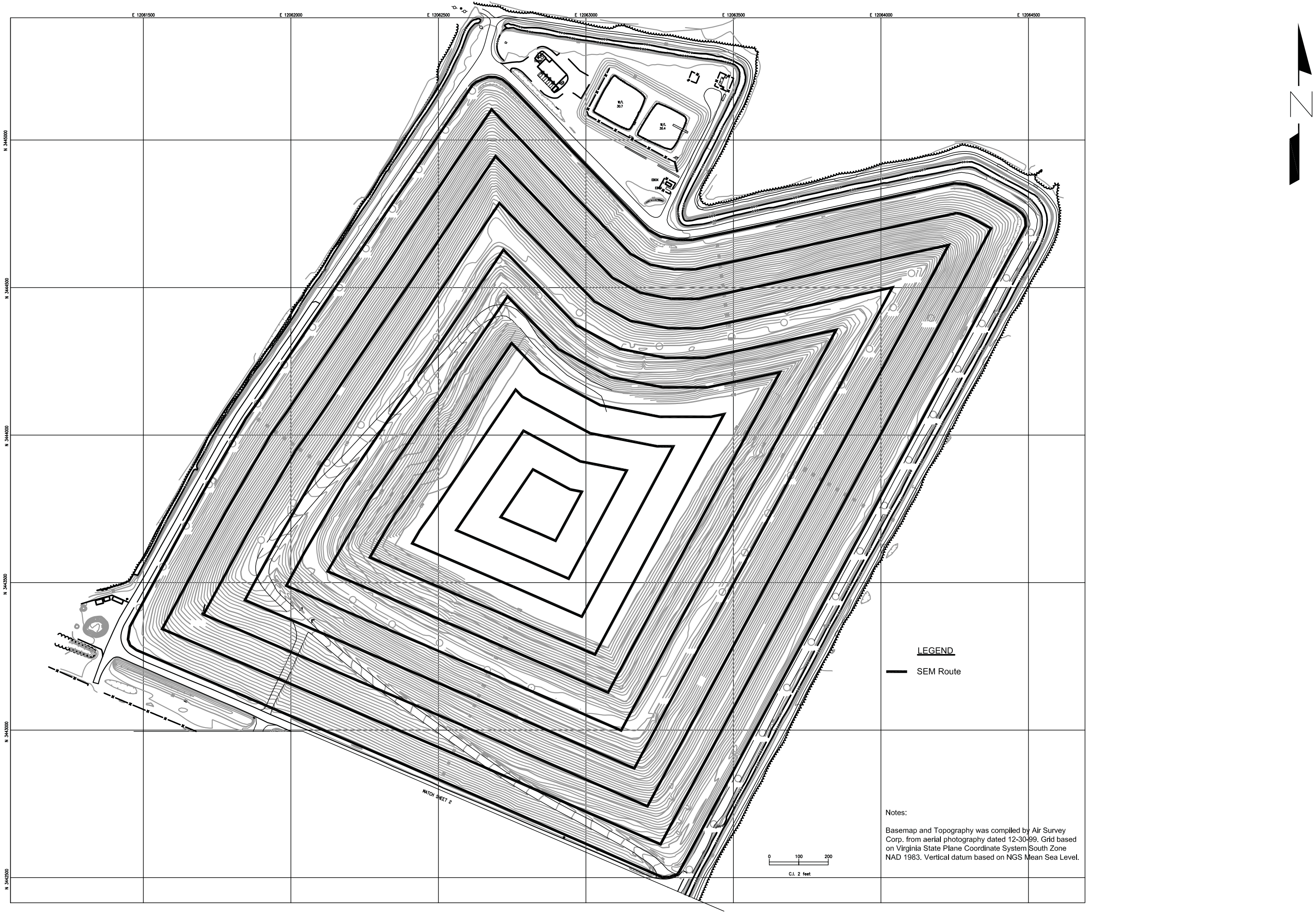
DRWN BY: RJK DATE: 6/28/07 FILE NAME: 02201081.02



LEGEND

▬ SEM Route

Notes:

Basemap and Topography was compiled by Air Survey Corp. from aerial photography dated 12-30-99. Grid based on Virginia State Plane Coordinate System South Zone NAD 1983. Vertical datum based on NGS Mean Sea Level.

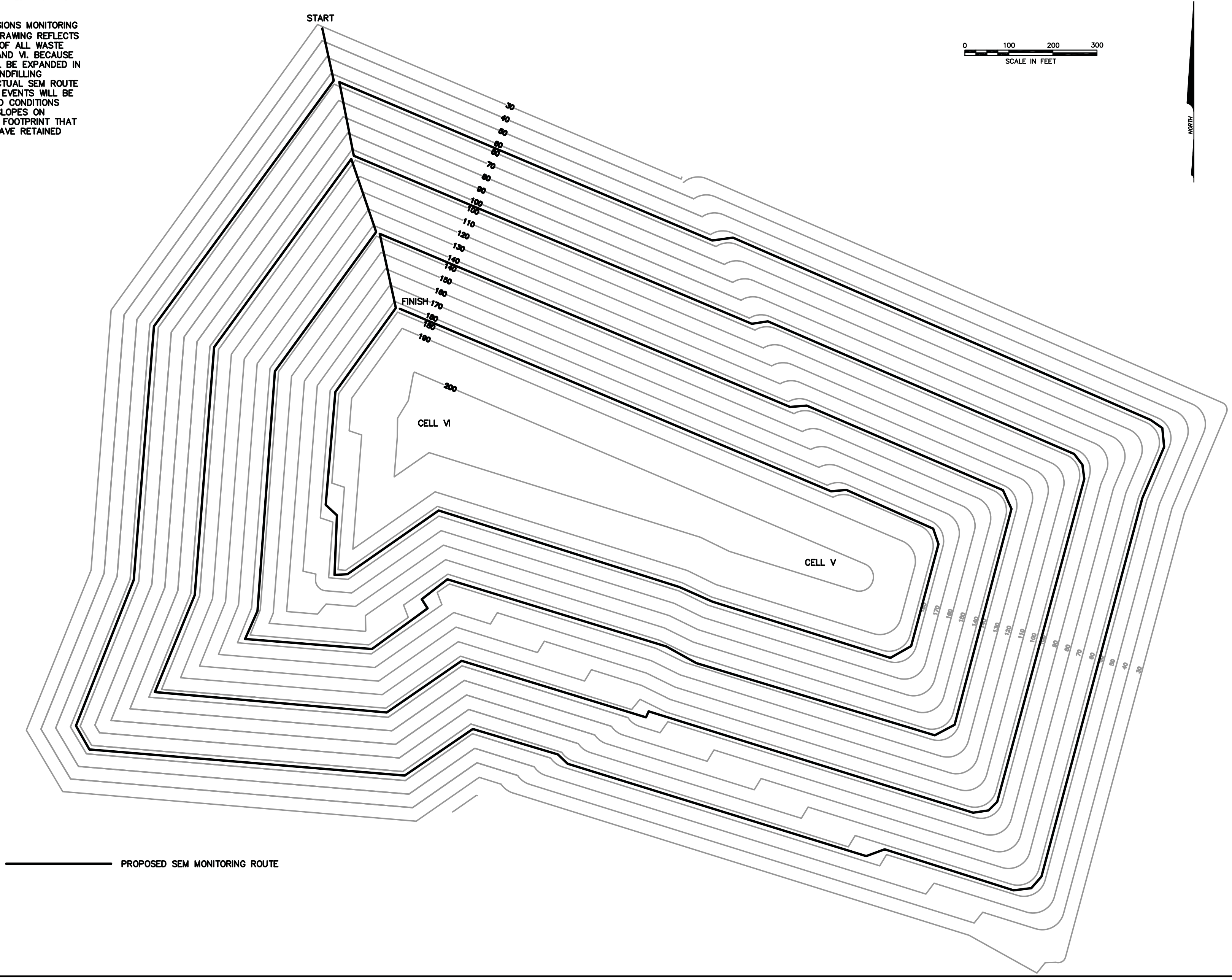
SCS ENGINEERS

TYPICAL SURFACE EMISSIONS MONITORING ROUTE
SPSA REGIONAL LANDFILL CELLS I-IV

NOTES:

1. PROPOSED FINAL GRADES OBTAINED FROM HDR INC.

2. THE PROPOSED SURFACE EMISSIONS MONITORING (SEM) ROUTE DEPICTED ON THE DRAWING REFLECTS THE PATTERN UPON COMPLETION OF ALL WASTE FILLIN GOPERATIONS IN CELLS V AND VI. BECAUSE THE LFG COLLECTION SYSTEM WILL BE EXPANDED IN CONJUNCTION WITH CONTINUED LANDFILLING OPERATIONS AT THE SITE, THE ACTUAL SEM ROUTE PERFORMED DURING THE ROUTINE EVENTS WILL BE ADJUSTED TO ACCOMMODATE FIELD CONDITIONS AND WILL EXCLUDE THE INTERIM SLOPES ON PORTIONS OF THE CELL VI WASTE FOOTPRINT THAT ARE NOT AT FINAL GRADE AND HAVE RETAINED WASTE FOR LESS THAN 5 YEARS.



NO.	REVISION	DATE
△		
△		
△		
△		
△		

SHEET TITLE
SEM MONITORING ROUTE

PROJECT TITLE
CONCEPTUAL LFG SYSTEM
MASTERPLAN FOR GCCS DESIGN

CLIENT
SOUTHEASTERN PUBLIC
SERVICE AUTHORITY
REGIONAL LANDFILL
SUFFOLK VIRGINIA

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
3229 ANDERSON HWY. #100 - POWHATAN, VA 23139
PH. (804) 598-9480 FAX. (804) 598-9485

PROJ. NO. 02201081.02	DWN. BY: GMW	Q/A RVW BY:
DSN. BY: GMW	CHK. BY: RED	APP. BY: RED

CADD FILE: SEM ROUTE

DATE: 6/28/07

SCALE: AS SHOWN

DRAWING NO.
1 of 1

M:\

ATTACHMENT II-3

Process Water Monitoring

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PROCESS WATER MONITORING PLAN

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Permit No. 417

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Prepared by:

HDR Engineering, Inc.

August 2008

TABLE OF CONTENTS

APPENDICES

SECTION 1.0
INTRODUCTION

1.1 PURPOSE

This Process Water Monitoring Plan (PWMP) documents procedures and instructions necessary to implement a process water monitoring program for Cell VI and VII of the Southeastern Public Service Authority (SPSA) Regional Sanitary Landfill (Permit No. 417) in Suffolk, Virginia. The purpose of the PWMP is to detect a contaminant release to the process water, and to protect surface water quality. Process water is groundwater discharge from groundwater dewatering sumps from underneath the waste cell composite liner system.

The Virginia Department of Environmental Quality (VDEQ) Division of Waste Management required a PWMP as part of the Part B permit application process. This PWMP was prepared as an attachment to Permit Module II – Operations Manual of the Part B permit application. This plan is effective during the life of the dewatering process, and will be terminated upon deactivation of the dewatering pumps due to sufficient waste ballast.

1.2 FACILITY INFORMATION

The SPSA Regional Sanitary Landfill is located on an 833-acre parcel at 1 Bob Foeller Drive in Suffolk, Virginia. The facility is owned and operated by SPSA of Chesapeake, Virginia. The geographic location of the facility is at latitude 36°45'19" and longitude 76°31'36". The facility is bound by State Route 58, 13, and 460 to the south-southwest and by wooded areas to the north, east, and west. The location of the site is illustrated on a portion of the Suffolk, Virginia, USGS 7.5-minute topographic quadrangle map presented as Figure 1 (Appendix A).

The SPSA facility was permitted to begin operation as a municipal solid waste (MSW) sanitary landfill in September 1983. The facility began disposing of (MSW) in January 1985 in Cells I-IV. A permit amendment dated March 4, 1994 added a 43.6-acre parcel to the pre-existing 103 lined acres, for a total of 146.6 acres of disposal area. The March 4, 1994 amendment also added an active methane gas recovery and power generation system to the existing landfill (Cells I-IV). Cell V was added under a permit amendment dated November 19, 1997 and Cell VI was added under a permit amendment dated November 7, 2005 for the previously permitted parcel.

The SPSA landfill includes four cells (Cells I-IV)constructed above the upper most water-bearing unit (Columbia Aquifer) and two cells (Cell V & VI) excavated below the static water table. The construction of Cell VII will also involve excavating below the static water table. Cells V and VI consist of a double composite liner system, a leachate collection system, and a groundwater dewatering system (refer to Part B permit application design drawings). The dewatering system for the collection of groundwater was installed separately from the leachate collection system. The dewatering system controls groundwater pressure on the bottom and sides of the Cell V and VI liner. Cell VII will be constructed in a similar fashion.

A summary of expansion and operations involved in the construction and use of Cell V and VI and additional amendments to the Facility can be seen in the landfill's Solid Waste Facility Permit No. 417.

The facility serves as a sanitary landfill for the disposal needs for the cities of Chesapeake, Norfolk, Portsmouth, Virginia Beach, and Franklin and the counties of Isle of Wight and Southampton. SPSA facilitates disposal operations, composting operations, and borrow areas. Maintenance operations are conducted from the Operations and Maintenance facility located inside the entrance of the landfill. A ferrous metal recovery facility, tire shredding operation, landfill gas-to-energy plant, petroleum contaminated soil bioremediation facility, and composting facility also operate at the site.

1.3 PROCESS WATER MONITORING PLAN

1.3.1 Sample Locations

The Cell VI and VII dewatering system involves the installation of a geocomposite drainage blanket in conjunction with drainage pipes that are directed to the following four sump locations beneath the landfill liner.

- Sump-5 – Located within Quadrant 5 of Cell VI
- Sump-6 – Located within Quadrant 6 of Cell VI
- Sump-7 – Located within Quadrant 7 of Cell VI
- Sump-8 – Located within Quadrant 8 of Cell VI
- Sump-9 – Located within Quadrant 9 of Cell VII
- Sump-10 – Located within Quadrant 10 of Cell VII
- Sump-11 – Located within Quadrant 11 of Cell VII
- Sump-12 – Located within Quadrant 12 of Cell VII
- Sump-13 – Located within Quadrant 13 of Cell VII

At each of these sump locations there is a submersible pump to allow discharge of groundwater to the facility's onsite permitted storm water outfalls. Groundwater emerging from these drainage sumps is hydraulically down-gradient of the solid waste. Construction details for the Cell VI and VII dewatering sump systems are included in Permit Module III Attachment 1. A site map illustrating the sump locations is included as Figure 2 (Appendix A).

1.3.2 Sampling Plan

A flow chart describing the sampling program (frequency, etc.) is included as Figure 3 (Appendix A). A list of the required analytical parameters is shown on Table 1-1.

A list of the appropriate analytical methods for each parameter listed below is included in Appendix B. Appropriate analytical methods for each parameter are published in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Third Edition (as updated).

TABLE 1-1
PARAMETER LIST

Priority Pollutant Metals	Volatile Organic Compounds	
Antimony	1,1,1,2-Tetrachloroethane	cis-1,2-Dichloroethene
Arsenic	1,1,1-Trichloroethane	cis-1,3-Dichloropropene
Barium	1,1,2,2-Tetrachloroethane	Dibromochloromethane
Beryllium	1,1,2-Trichloroethane	Ethylbenzene
Cadmium	1,1-Dichloroethane	Methyl bromide
Chromium (III)	1,1-Dichloroethene	Methyl chloride
Cobalt	1,2,3-Trichloropropane	Methyl ethyl ketone
Copper	1,2-Dibromo-3-chloropropane	Methyl iodide
Lead	1,2-Dibromoethane	Methylene bromide
Nickel	1,2-Dichloroethane	Methylene chloride
Selenium	1,2-Dichloropropane	o-Dichlorobenzene
Silver	2-Hexanone	p-Dichlorobenzene
Thallium	4-Methyl-2-pentanone	Styrene
Vanadium	Acetone	Tetrachloroethene
Zinc	Acetonitrile	Toluene
	Benzene	trans-1,2-Dichloroethene
	Bromochloromethane	trans-1,3-Dichloropropene
	Bromodichloromethane	trans-1,4-Dichloro-2-butene
	Bromoform	Trichloroethene
	Carbon Disulfide	Trichlorofluoromethane
	Carbon Tetrachloride	Vinyl acetate
	Chlorobenzene	Vinyl chloride
	Chloroethane	Xylenes
	Chloroform	

SECTION 2.0
SUMP OPERATIONS AND MAINTENANCE

2.1 SUMP OPERATION PROCEDURES

2.1.1 Installation Methods

Sump design and construction incorporates techniques and materials in general accordance with the Solid Waste Permit and additional permit module amendments. Each sump constructed will consist of a specific excavated area below each leachate collection sump. The groundwater sumps will be comprised of a geocomposite drainage layer overlain with VDOT No. 5 stone wrapped with a geotextile fabric. A 24-inch HDPE side riser pipe will be laid in the middle of the sump with a submersible pump for the removal of the groundwater. The geocomposite drainage layer, in conjunction with perforated drainage pipes, will convey groundwater to the sumps.

2.1.2 Monitoring Location Surveying

The northing and easting of the monitoring point along each dewatering sump will be established to ±0.01 foot accuracy. All surveying is in relation to the existing landfill datum, which is established from a National Geodetic Vertical Datum. In addition, each monitoring location will be marked with a unique identification number.

2.1.3 Baseline Sampling & Analysis

Prior to the placement of waste within Cell VII, the facility will establish pre-disposal baseline values for all the fifteen (15) inorganic parameters and forty-seven (47) organic parameters listed in Table 1-1. If the construction and operations schedule allows, a minimum of four independent sampling events, collecting samples from each sump will be performed and analyzed for all Table 1-1 parameters.

2.2 SUMP OUTLET MAINTENANCE

Prior to each sampling event, the field technician will visually observe each sump vault location for evidence of damage or malfunction. Each sump will be re-marked with its unique identification number should it become indiscernible. Vegetative overgrowth posing an access or workspace problem around a sump monitoring location will be mowed. The application of chemicals (herbicide, pesticide, etc.) to control weeds and insects must be undertaken on a limited basis to avoid introducing contamination around the sump.

SECTION 3.0
SAMPLE COLLECTION

3.1 BOTTLE KIT PREPARATION

A sample collection bottle kit will be prepared for the sample parameter list by the laboratory in accordance with approved sample analysis methods. A summary of the types of sample containers, sample handling, and preservation procedures for Table 1-1 parameters is included in Appendix B. The sample kit will be stored in clean coolers for transport to the site

3.2 SAMPLE COLLECTION PROCEDURES

Samples will be collected in new, laboratory-provided sampling containers with the appropriate volume and preservatives needed as specified by the selected analytical method. Process water will be sampled from the discharge pipe of each dewatering sump. The discharge pipe is located prior to any confluence with water from the other dewatering sump. Samples will be stored in an iced cooler immediately after sample collection, and all samples will be secured and tracked using chain-of-custody procedures as specified by the contract laboratory.

Sump monitoring locations unable to be sampled due to dryness of the sump will be noted in the field observations. A second attempt to sample the sump monitoring location will be made before the end of the compliance period. If the condition of the sump remains unchanged, VDEQ will be informed of such an occurrence in the corresponding process monitoring report.

3.3 SAMPLE DOCUMENTATION

3.3.1 Sample Bottle Labeling

The bottles will be properly labeled for identification and will include the following information.

- Sample ID
- Date and Time
- Sample Type – grab or composite
- Analysis Parameter(s)/Method
- Preservative
- Sampler(s)
- Sample Matrix

3.3.2 Field Logs

Field technicians shall maintain up-to-date field logs documenting important information pertaining to field activities. A blank copy of the daily field log and process water sampling log are included in Appendix C.

The field log sheets will document the following:

- Personnel
- Site Name/Location
- Date of Sampling Event
- Climactic Conditions
- Sample Location Identification
- Time of Sample Collection
- Comments on Sampling Event

The field notes will be reviewed upon the completion of each monitoring event to verify that the monitoring requirements of this Plan are met and to identify any unusual circumstances which may effect the implementation of the PWMP.

3.3.3 Chain-of-Custody

Sample storage, handling, and transport will be strictly controlled to prevent sample cross-contamination. Chain-of-Custody control for all samples will consist of the following:

- Sample containers will be securely placed in coolers (iced) and will remain in the continuous possession of the field technician until transfer of the samples to the courier or laboratory has occurred.
- If the samples are to leave the possession of the sampling crew, the sample containers or coolers will be individually sealed to ensure that the samples have not been tampered with during transportation.
- Upon delivery to the laboratory, samples will be given laboratory sample numbers and recorded into a logbook indicating client, well number, date and time of delivery. The laboratory director or his/her designee will sign the Chain-of-Custody control forms and formally receive the samples. The field technician and laboratory director will work together to ensure that proper refrigeration of the samples is maintained.
- The Chain-of-Custody document will contain the following information (see Appendix C):
    - Client Name
    - Client Project Name
    - Client Contact
    - Client Address
    - Client Phone/Fax Number
    - Sampler(s) Name and Signature
    - Sample ID
    - Date
    - Time
    - Type of Container and Preservative
    - Number of Containers
    - Matrix
    - Sample Type - Grab or Composite
    - Analysis Parameter(s)/Method

3.4 QUALITY ASSURANCE & QUALITY CONTROL

3.4.1 Atmospheric Contamination

In the event of rain and/or other adverse conditions, steps must be taken to protect the monitoring location, sampling bottles, and sampling equipment. In the event of a thunderstorm and/or harsh conditions, which may compromise field personnel safety and/or the sampling event, the field supervisor will decide whether to cease or continue sampling. This information will be relayed to the project manager immediately.

Atmospheric contamination must be avoided. Vehicle exhaust, particulate (i.e. dust and plant fallout), rain, or other contaminants must not be allowed to come into contact with the samples. If maneuvering to the monitoring location by vehicle, every effort will be made to approach the monitoring location from downwind and to park the vehicle downwind of the monitoring location. The vehicle's engine will not be running in close proximity to the monitoring location.

In the event the field technician observes a situation that, in his/her judgment, could compromise the validity of the sampling or the health and safety of personnel, the field technician will immediately cease sampling and contact the field supervisor. Some instances are:

- Inclement weather
- Dust or particulate from plants or equipment
- Spraying of chemicals
- Dramatic changes in water quality (dry sump)

The field supervisor will in turn contact the project manager who will make a decision to continue sampling or terminate the event. If the field supervisor terminates any sampling event, the re-sampling event will be rescheduled and completed within thirty days of the original sampling event.

3.4.2 Decontamination Procedures

All equipment used for sampling will be decontaminated before it is taken from the site. All equipment coming in contact with media suspected of being contaminated will be decontaminated before it contacts a media which is likely to be less contaminated or uncontaminated.

Any non-dedicated sampling equipment will be thoroughly decontaminated between sample locations by disassembling and will be cleaned in the following manner.

- Rinse with tap water.
- Wash with a non-phosphate laboratory detergent and tap water.
- Rinse with distilled water.
- Allow to air dry.
- All decontamination fluids will be managed and disposed of in accordance with VDEQ regulations. Disposable items will be disposed of as solid waste in an approved, permitted facility.

3.4.3 Quality Control Blank Sampling

Field quality control (QC) involves the routine collection and analysis of two types of QC blanks; trip and field blanks, to verify that the sample collection and handling processes have not impaired the quality of the samples.

- **Trip Blank** – Trip blanks are prepared for VOC and EDB/DBCP analysis. Laboratory personnel fill one of each type of sample bottle with deionized water and transport them to the site. Field personnel handle them like a sample and return them to the laboratory for analysis. Trip blanks are prepared immediately prior to the sampling event and transported with the empty bottle kits. A trip blank is used to indicate potential contamination due to migration of volatile organic compounds from the air on the site or in the sample shipping containers, through the septum or around the lid of the sampling vials and into the sample.
- **Field Blank** – The field blank is a sample of deionized water, which is taken to the field and used as rinse water for sampling equipment. The field blank is prepared like the actual samples and returned to the laboratory for identical analysis. A field blank is used to determine if certain field sampling or cleaning procedures result in cross-contamination of site samples or if atmospheric contamination has occurred.

3.4.4 Quality Assurance Sampling

Field quality assurance (QA) may also involve the routine collection and analysis of replicate field samples. These samples are collected at a rate of one per sample event. Replicates are two separate samples collected independently in such a manner that they equally represent the medium at a given time and location. Co-located samples provide intra-laboratory precision information for the entire measurement system, including sample collection, homogeneity, handling, shipping, storage, preparation, and analysis.

SECTION 4.0
LABORATORY ANALYSIS

Typically, all sample analyses should be completed within fourteen (14) days from sample collection. Once completed and reviewed, the project manager should be alerted to any problems with the analysis results and the potential need for re-sampling. If possible, re-sampling will occur within thirty days (30) of the original sampling event.

The laboratory's Quality Assurance/Quality Control (QA/QC) Manual will be used to ensure the integrity of the data for all aspects of the analysis. All analyses will be conducted in accordance with the methods presented in US-EPA SW-846, Test Methods for Evaluating Solid Waste, 3rd Edition. The analyzing laboratory will be certified by both US-EPA and VDEQ.

All samples, including the trip and field blanks, will be assigned unique laboratory identification numbers. At the time of sample receipt, they will be inspected for integrity and for consistency with information entered on the Chain-of-Custody document. They will also be tested for proper preservation or, in the case of volatile organic samples, inspected for lack of air bubbles in the sample vials. Deviations from any applicable protocol will be noted on the Chain-of-Custody document. Missing, broken, or improperly preserved samples will be replaced within ten (10) working days from the date that the deviation is first noted.

While awaiting analysis, samples will be stored in a secure location, under refrigeration (if refrigeration is a required method of preservation). If for any reason a method-prescribed holding time is exceeded, the sample will be discarded and replaced with a freshly collected sample.

4.1 ANALYTICAL DETECTION & QUANTITATION LIMITS

All analytical results will be reported relative to both a limit of detection (LOD) and a limit of quantitation (LOQ). LOD and LOQ values are parameter/method/matrix-specific. Sub-LOD results will be reported as not detected. Results equal to the LOD value, or above the LOD value but below the LOQ value, will be reported as estimated values. Results equal to or greater than the LOQ value will be reported without estimation.

If available, analytical methods will be selected to yield LOQ values that are equal to or below groundwater protection standards for the required parameters, if possible.

To establish parameter-specific LOD and LOQ Values, the following procedures and/or conventions will be applied:

- If an LOD study has been performed, LOD values will be estimated using procedures set forth at 40 CFR 136, Appendix C.
- In the absence of an LOD study, LOD values published in SW-846 will be accepted as default values. In the event that an SW-846 method cites quantitation limits rather than

detection limits (e.g. SW-846 Method 8270B), the LOD values will be assumed equal to 20% of the published quantitation limits.

- Whether the LOD values are experimentally derived, or adopted from SW-846, LOQ values will be as recommended in SW-846. If a particular method provides parameter-specific LOD values instead of LOQ values (e.g. SW-846 Method 8260A and most methods for metals), LOQ values will be obtained by multiplying the published LOD values by a factor of ten (10). (The use of published LOQ values from the outset will ensure consistency over the course of the monitoring program, thereby avoiding the introduction of artificial variability in non-detect data sets due to periodic changes in the actual LOD/LOQ values).
- It is conceivable that adjustments may need to be made from time to time due to circumstances beyond the direct control of project personnel. Such adjustments may derive from the need to dilute the sample to allow for quantitation within the linear portion of the calibration curve, or from the appearance of common laboratory contaminants in the laboratory method blanks, or from the occurrence of matrix interferences. Any such adjustments will be made only if absolutely necessary to comply with SW-846 requirements for data quality. All such adjustments will be explained and justified in a case narrative attached to the analytical report. Preliminary results (e.g. results for an undiluted sample) will be included with the case narrative.

A list of the corresponding LOD and LOQ values for each analytical parameter is included in Appendix B.

4.2 QUALITY ASSURANCE & QUALITY CONTROL

Laboratory QA/QC involves the routine collection and analysis of method reagent blanks, matrix spike and matrix spike duplicate samples, and laboratory control samples, to verify that the sample analysis procedures have not impaired the quality of the samples.

- Method Reagent Blank – The method reagent blank results from the treatment of deionized water with all of the reagents and manipulations to which site samples will be subjected. Positive results in the method reagent blank may indicate either contamination of the chemical reagents or the glassware and implements used to store or prepare the sample and resulting solutions.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) – A matrix spike is an aliquot of a field sample with a known concentration of target parameter added to it. A matrix spike duplicate is an intralaboratory split sample spiked with a known concentration of target parameter. Spiking for each occurs prior to sample analysis. MS/MSD samples are collected for every batch of twenty or fewer samples. Matrix spike recoveries are used to indicate what effect the sample matrix may have on the reported concentration and/or the performance of the sample preparation and analysis.
- Laboratory Control Samples (LCS) – These samples generally consist of deionized water injected with the parameters of interest for single parameter methods and selected

parameters for multi-parameter methods according to the appropriate analytical method. LCS samples are prepared and analyzed for each batch containing twenty or fewer samples. LCS recoveries are used to monitor analytical accuracy.

Surrogate recoveries are also measured as a part of laboratory QA/QC. Surrogates are organic compounds that are similar to the parameters of interest in chemical composition, extraction, and chromatography, but are not normally found in environmental samples. These compounds are spiked into all blank, standards, samples, and spiked samples prior to analysis for organic parameters only. Percent recoveries are calculated for each surrogate. Spike recoveries at or below acceptance criteria indicate whether analytical results can be considered biased high or biased low.

Laboratory QA/QC also involves the routine collection and analysis of replicate field samples. These samples are collected at a rate of one per sample event. Replicates are two separate samples collected independently in such a manner that they equally represent the medium at a given time and location. Co-located samples provide intra-laboratory precision information for the entire measurement system, including sample collection, homogeneity, handling, shipping, storage, preparation, and analysis.

SECTION 5.0
DATA ANALYSIS

5.1 CENSORING "NON-DETECT" DATA

In order to filter analytical data that may not represent valid results, all data from the monitoring events are censored. Data flagged with a "J" qualifier indicates the quantitation of the parameter is less than the LOQ but greater than the LOD. Data flagged with a "B" qualifier indicates the parameter was not detected significantly above the level reported in the laboratory blank. Parameters detected above the LOQ and not flagged with a "B" qualifier are subject to evaluation.

5.2 CHECKING DATA FOR OUTLIERS

An outlier test is performed to evaluate the presence of possible outliers in the data. The test uses a standard t-test to compare the largest value of a sample to the remaining values to evaluate whether an outlier is present. The test for outliers involves comparing the individual data points for each parameter from the same location against the remaining data from all other sampling events. If an individual data point deviates from the remainder of the data by a calculated amount, it is flagged as an outlier. If an outlier is detected, the data is not necessarily discarded, but rather viewed as possibly causing a false-negative or false-positive result. Potential causes of outliers can include: natural variation in water quality, sampling method inconsistencies, laboratory analysis errors, and data transcription errors.

5.3 COMPARISONS TO GROUNDWATER PROTECTION STANDARDS

The sampling results are directly compared to the site-specific Groundwater Protection Standards (GPS). A list of the site-specific GPS is provided in Appendix B.

Based on VDEQ and EPA guidance (Code of Federal Regulations 40 CFR 258.55 (h) and (i)), site-specific GPS were developed for the entire list of Table 1-1 parameters. In accordance with 9 VAC 20-80-300 B 3 h and I, the GPS were established by comparing the background concentration, Maximum Contaminant Level (MCL), and the Alternate Concentration Limit (ACL) for the parameter of concern.

5.4 VERIFIED GPS EXCEEDANCES

The facility shall notify VDEQ in writing within two (2) days of the receipt of laboratory analytical results of all verified GPS exceedances. In addition, the detection of a Table 1-1 parameter above the GPS in any sump will trigger the following actions:

- Treatment of the water from the impacted sump as leachate, and
- Adjustment to the sampling schedule in accordance with the flow chart included as Figure 3 (Appendix A).

Conversely, the facility may implement a reduction in sampling frequency if the conditions described on Figure 3 (Appendix A) occur. If there are no GPS exceedances for the parameters listed in Table 1-1, the water will be treated as surface water and will be discharged to onsite permitted storm water outfalls.

5.5 DATA EVALUATION CONSIDERATIONS

5.5.1 Treatment of Non-Detects in Background

The amount of data that are below the detection limits plays an important role in selecting the appropriate statistical evaluation method. As a general guideline, if less than 50 percent of the values are reported as not detected, the data will be evaluated following parametric methods. If ranges between 50 and 90 percent of the data are reported as "not detected", the LOD for each parameter will be substituted, and a non-parametric statistical method is utilized. If >90% of the data are ND's, the non-detected will be transformed into 50% Detection limit and evaluated for non-parametric prediction limit.

5.5.2 Significant Levels

Another consideration involves the level of significance established for each set of statistical procedures. Each test can be performed at different levels of significance, ranging from 90 to 99 percent. The choice of a significance level requires the consideration of its effect upon the occurrence of a false-positive result (those where the test concludes something occurs when it actually does not) or a false-negative result (where something has occurred but the test does not recognize it). If, for example, a higher level of significance is selected to reduce the percent of false positives, then the percent of false negatives will increase.

5.5.3 False Positive Rates

Another consideration is the "experiment-wise false positive error rate." Because statistical error rates accumulate with use, as more tests are conducted an increased percentage of false conclusions will result. This is a commonly recognized problem for sites with numerous sampling locations and where a large number of parameters are analyzed. All statistical tests performed will be conducted using a significance level of 95 percent (i.e. - a false positive rate of 5 percent). For most statistical tests a significance level of 95 percent is acceptable to VDEQ.

SECTION 6.0
REPORTING

6.1 PROCESS MONITORING REPORT

After establishing baseline data, and after waste placement begins in Cell VI and VII, the facility shall, prior to the close of each compliance period, submit to the VDEQ, a Process Monitoring Report including the results of the analytical data, in a format/manner necessary for the determination of statistically significant increases and/or GPS exceedances. Analytical results will be reported in the form of a laboratory report that will contain the following information:

- Facility name/location
- Date issued
- Sample identity/description
- Date/time of sample collection
- Data/time of sample analysis
- Analytical method citations
- Analytical results, relative to the appropriate LOD and LOQ values
- Signature of authorized laboratory representative
- Copy of Chain of Custody documents

If requested, an expanded analytical QA/QC package can be prepared for each batch of samples. Because of the additional costs associated with the expanded package, it is not deemed necessary for all rounds of samples. The laboratory collects all of the necessary information for the formation of the expanded package, but does not prepare one unless requested. The expanded QA/QC package will include the following elements:

- Case narrative documenting chronology of events, holding times, and methods of analysis; also addressing any deviations and their effect, if any, on data quality
- Instrument-generated tuning results for GC/MS instrument systems
- Method Reagent Blank Report
- Laboratory Control Sample Report
- Surrogate recovery report
- Matrix spike recovery report
- Instrument-generated chromatograms
- Relative percent deviation report for duplicate samples
- Laboratory Bench Sheets

Each report will also contain the data analysis of laboratory results. Analysis of monitoring data may include the following.

- Summary of QA/QC samples and effects on the data
- Identification of suspected outlier data
- Identification of direct exceedances in detected parameter concentrations when compared to approved Groundwater Protection Standards

APPENDIX A

Figure 1 - USGS Topographic Map

•

Figure 2 – Sump Location Map

•

Figure 3 – Process Monitoring Sampling Schedule Flow Chart

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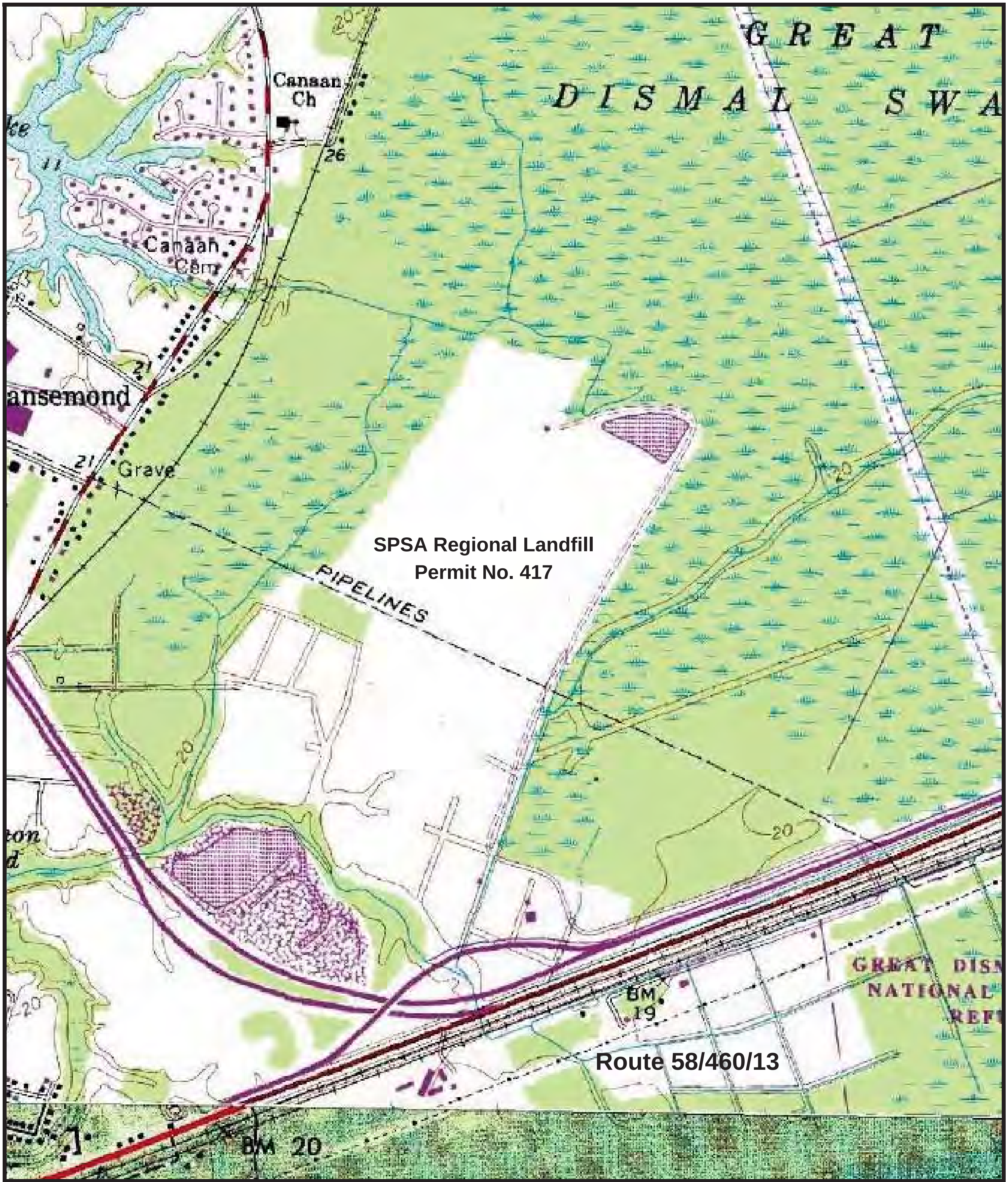

Figure 1 – USGS 7.5' Quadrangle of Suffolk, VA

SPSA Regional Landfill

Permit No. 417 - City of Suffolk, Virginia

Scale: 1 inch = 1,200feet

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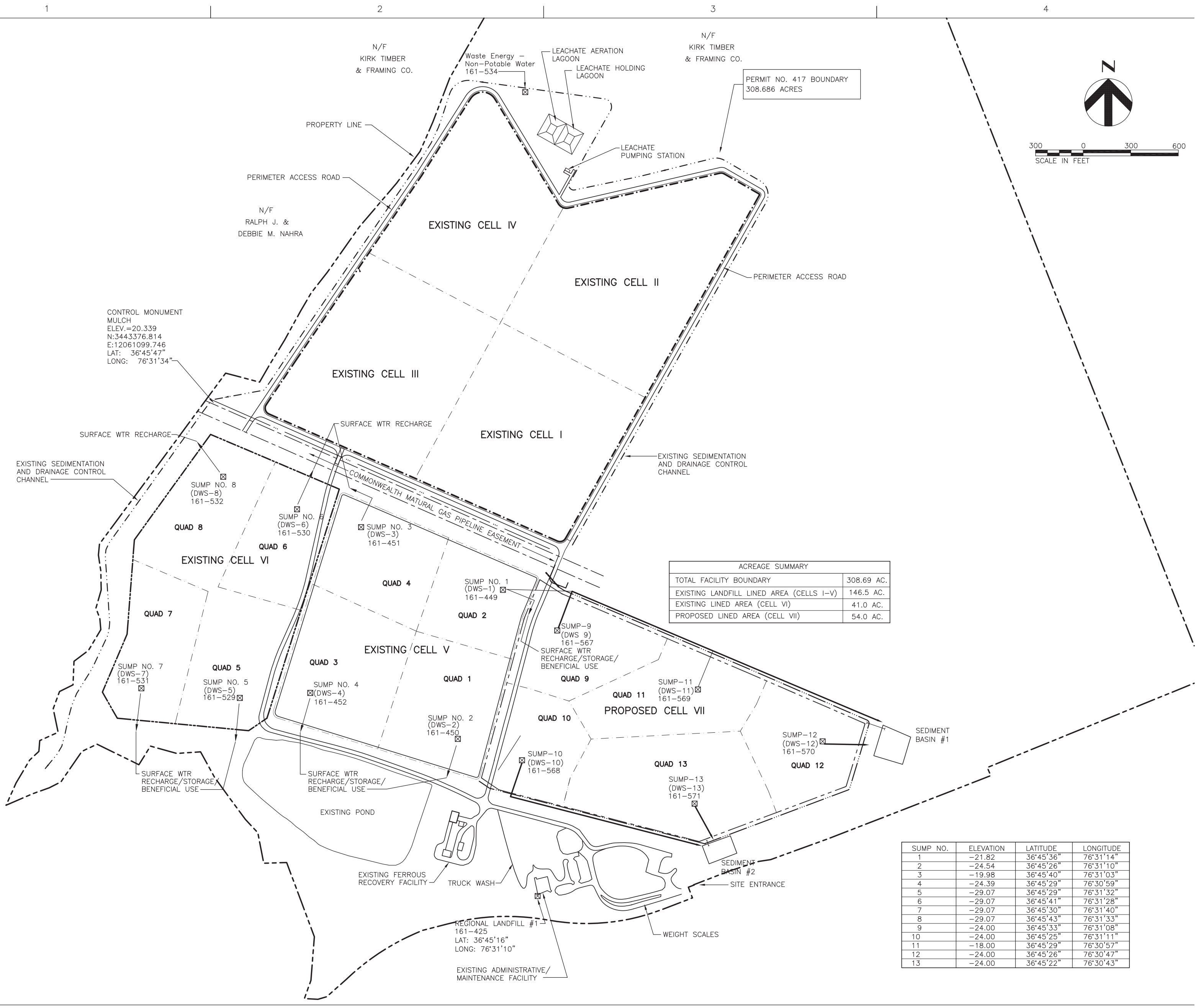

ACREAGE SUMMARY	
TOTAL FACILITY BOUNDARY	308.69 AC.
EXISTING LANDFILL LINED AREA (CELLS I–V)	146.5 AC.
EXISTING LINED AREA (CELL VI)	41.0 AC.
PROPOSED LINED AREA (CELL VII)	54.0 AC.

SUMP NO.	ELEVATION	LATITUDE	LONGITUDE
1	−21.82	36°45'36"	76°31'14"
2	−24.54	36°45'26"	76°31'10"
3	−19.98	36°45'40"	76°31'03"
4	−24.39	36°45'29"	76°30'59"
5	−29.07	36°45'29"	76°31'32"
6	−29.07	36°45'41"	76°31'28"
7	−29.07	36°45'30"	76°31'40"
8	−29.07	36°45'43"	76°31'33"
9	−24.00	36°45'33"	76°31'08"
10	−24.00	36°45'25"	76°31'11"
11	−18.00	36°45'29"	76°30'57"
12	−24.00	36°45'26"	76°30'47"
13	−24.00	36°45'22"	76°30'43"

HDR

HDR Engineering, Inc.

SPSA

SANITARY LANDFILL

GROUND WATER WITHDRAWAL
SPECIAL EXCEPTION CELL VII
REGIONAL SOLID WASTE AND
RESOURCE RECOVERY PROJECT

ISSUE	DATE	DESCRIPTION

PROJECT NUMBER	00002889.018
PROJECT MANAGER	D.T. DeCESARE, P.E.
	A.J. WHITE, P.G.
	J.E. GAUL

0 1" 2"

PROPOSED GROUNDWATER WITHDRAWAL SCHEMATIC

SCALE 1"=300'

2

FILENAME FIG 2

C:\PWworking\TPA\d0128198\FIG2.dwg, Layout1, 5/23/2008 2:08:38 PM, gblue

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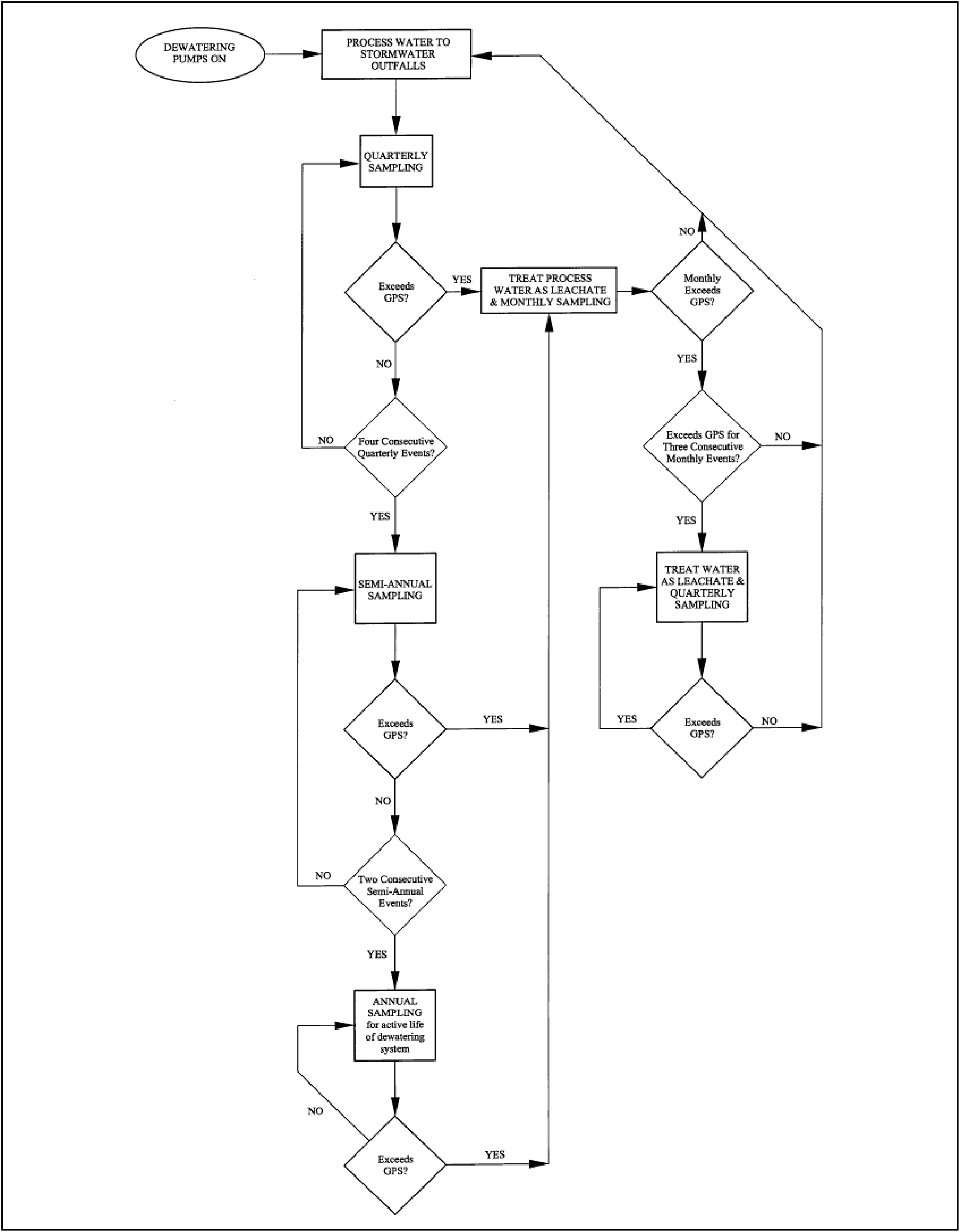

FIGURE 3 – PROCESS WATER MONITORING PROGRAM SAMPLING SCHEDULE

APPENDIX B

Analytical Parameters

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SPSA Regional Sanitary Landfill - VDEQ Permit No. 417
Analytical Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)	Volatility	Carcinogenicity	GPS (ug/L)	Source of GPS
Priority Pollutant Metals										
Antimony	7041	500 mL - plastic	6 months	HNO_3 to pH <2	1	5	NV	NC	8	Background
Arsenic	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	3	10	NV	C, NC	10	MCL
Barium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10	NV	NC	2000	MCL
Beryllium	7091	500 mL - plastic	6 months	HNO_3 to pH <2	0.1	0.5	NV	NC	6	Background
Cadmium	7131A	500 mL - plastic	6 months	HNO_3 to pH <2	0.1	0.5	NV	NC	5	MCL
Chromium (III)	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	1	10	NV	NC	100	MCL
Cobalt	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10	NV	NC	313	ACL
Copper	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	3	5	NV	NC	626	ACL
Lead	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	6	10	NV	ND	15	MCL[1]
Nickel	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10	NV	C	313	ACL
Selenium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10	NV	NC	50	MCL
Silver	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10	NV	NC	78.25	ACL
Thallium	7841	500 mL - plastic	6 months	HNO_3 to pH <2	2	2	NV	NC	2	MCL
Vanadium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10	NV	NC	109.55	ACL
Zinc	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	10	20	NV	NC	4695	ACL
Volatile Organic Compounds										
1,1,1,2-Tetrachloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0	V	C, NC	0.41	ACL
1,1,1-Trichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	NC	200	MCL
1,1,2,2-Tetrachloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0	V	C, NC	0.05	ACL
1,1,2-Trichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	5	MCL
1,1-Dichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	NC	296.08	ACL
1,1-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	7	MCL

1 = Treatment Technology Standard
ACL = Alternate Concentration Limit
C = Carcinogen
GPS = Groundwater Protection Standard
LOD = Limit of Detection
LOQ = Limit of Quantitation

MCL = Maximum Concentration Limit
NC = Non-Carcinogen
ND = No Data Available
NV = Non-Volatile
V = Volatile

SPSA Regional Sanitary Landfill - VDEQ Permit No. 417
Analytical Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)	Volatility	Carcinogenicity	GPS (ug/L)	Source of GPS
1,2,3-Trichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	0.01	ACL
1,2-Dibromo-3-chloropropane	8011	60 mL (2) - Amber VOA	14 days	4°C; 6 drops conc. HCl; No head space	0.010	0.01	V	C, NC	0.2	MCL
1,2-Dibromoethane	8011	60 mL (2) - Amber VOA	14 days	4°C; 6 drops conc. HCl; No head space	0.008	0.01	V	C, NC	0.05	MCL
1,2-Dichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	5	MCL
1,2-Dichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5	V	C, NC	5	MCL
2-Hexanone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10	NV	NC	626	ACL
4-Methyl-2-pentanone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.2	10	V	NC	50.08	ACL
Acetone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	7.0	10	V	NC	223.57	ACL
Acetonitrile	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10	V	NC	38.01	ACL
Benzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	5	MCL
Bromochloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.4	1.0	ND	ND	1.0	LOQ
Bromodichloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	80	MCL
Bromoform	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0	NV	C, NC	80	MCL
Carbon Disulfide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.2	10	V	NC	391.25	ACL
Carbon Tetrachloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	5	MCL

1 = Treatment Technology Standard
ACL = Alternate Concentration Limit
C = Carcinogen
GPS = Groundwater Protection Standard
LOD = Limit of Detection
LOQ = Limit of Quantitation

MCL = Maximum Concentration Limit
NC = Non-Carcinogen
ND = No Data Available
NV = Non-Volatile
V = Volatile

SPSA Regional Sanitary Landfill - VDEQ Permit No. 417
Analytical Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)	Volatility	Carcinogenicity	GPS (ug/L)	Source of GPS
Chlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0	V	NC	100	MCL
Chloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	3.64	ACL
Chloroform	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	80	MCL
cis-1,2-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5	V	NC	70	MCL
cis-1,3-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	0.08	ACL
Dibromochloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	0.13	ACL
Ethylbenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0	V	NC	700	MCL
Methyl bromide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	NC	3.13	ACL
Methyl chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0	V	ND	2.11	ACL
Methyl ethyl ketone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10	V	NC	691.08	ACL
Methyl iodide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10	NV	ND	10	LOQ
Methylene bromide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0	V	NC	22.36	ACL
Methylene chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0	V	C, NC	5.000	MCL
o-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5	V	NC	600	MCL
p-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5	V	C, NC	75	MCL

1 = Treatment Technology Standard
ACL = Alternate Concentration Limit
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LOD = Limit of Detection
LOQ = Limit of Quantitation

MCL = Maximum Concentration Limit
NC = Non-Carcinogen
ND = No Data Available
NV = Non-Volatile
V = Volatile

SPSA Regional Sanitary Landfill - VDEQ Permit No. 417
Analytical Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)	Volatility	Carcinogenicity	GPS (ug/L)	Source of GPS
Styrene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0	V	NC	100	MCL
Tetrachloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	5	MCL
Toluene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	NC	1000	MCL
trans-1,2-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5	V	NC	100	MCL
trans-1,3-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	0.08	ACL
trans-1,4-Dichloro-2-butene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.1	4.0	NV	ND	4.0	LOQ
Trichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	5	MCL
Trichlorofluoromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	NC	469.5	ACL
Vinyl acetate	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	2.2	10	V	NC	147.53	ACL
Vinyl chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0	V	C, NC	2	MCL
Xylenes	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	3.0	V	NC	10000	MCL

1 = Treatment Technology Standard
ACL = Alternate Concentration Limit
C = Carcinogen
GPS = Groundwater Protection Standard
LOD = Limit of Detection
LOQ = Limit of Quantitation

MCL = Maximum Concentration Limit
NC = Non-Carcinogen
ND = No Data Available
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V = Volatile

APPENDIX C

Daily Field Log

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Process Water Sample Log

•

Chain-Of-Custody Form

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DAILY FIELD REPORT

Project Name:	SPSA Regional Sanitary Landfill	**Project Number:**	
		Task:	Laobr Code:
Project Manager:		**Field Personnel:**	
Date:	Vehicle:	**Miles Billed:**	Travel Time:
Weather:			
Labor	**Hours**	**Equipment**	**Materials**

Work Completed:

Prepared by:

Reviewed by:

SPSA

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Process Water Sampling Log

Southeastern Public Service Authority
Dept. of Environmental & Safety Management
1 Bob Foeller Drive
Suffolk, Virginia 23434

Project Name: SPSA Regional Landfill	**Sampler(s):**
Project Number:	**Task:**

WELL PURGING RECORD

Location ID	Sample Date	Sample Time	Observations

ASSESSMENT GROUNDWATER SAMPLING RECORD

Parameter	Container	Preservative

Samples Shipped By: ____________________ Laboratory: ____________________

Sampled By: ____________________ Date: ____________________

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LABORATORIES, INC.

CHAIN OF CUSTODY

PAGE ______OF _____

CLIENT NAME:		PROJECT NAME:
CLIENT CONTACT:		SITE NAME:
CLIENT ADDRESS:		PROJECT NUMBER:
CLIENT PHONE NUMBER:		P.O. NUMBER:
CLIENT FAX NUMBER:	EMAIL:	REGULATORY AUTHORITY:
Is sample for compliance reporting? YES NO	Is sample from a chlorinated supply? YES NO	PWS I.D. #:
SAMPLER NAME (PRINT):	SAMPLER SIGNATURE:	Turn Around Time: **Day(s)**

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other ______								Quote I.D.: PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1)																						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	**QC Data Package** Level I ☐	**LAB USE ONLY** **COOLER TEMP** ________°C
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	Level II ☐	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	Level III ☐ Level IV ☐	

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DESIGN REPORT

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Prepared by:

HDR Engineering, Inc.

August 2008
Revised February 2009
Revised March 2010
Revised April 2010
Revised July 2010

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TABLE OF CONTENTS

LIST OF DRAWINGS

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SECTION 1.0
INTRODUCTION

1.1 GENERAL

The purpose of this document is to obtain a Permit to Construct from the Virginia Department of Environmental Quality (VDEQ) for the Cell VII Expansion (Expansion), located to the east of the Subtitle D Cell V of the existing Southeastern Public Service Authority of Virginia (SPSA) Regional Landfill (Landfill), Solid Waste Permit No. 417, located in Suffolk, Virginia. Waste disposed at the Landfill is accepted from the Cities of Chesapeake, Franklin, Norfolk, Portsmouth, Suffolk, and Virginia Beach, and the Counties of Isle of Wight and Southampton. Approximately 700 industries and collection and transportation agencies are currently served. The Landfill facility boundary encompasses approximately 376 acres of which 69 acres was added for the Cell VII expansion as a result of the Cell VII Permit A Application dated November 2007. The Cell VII expansion will include approximately 56 acres of additional lined area bringing the total lined area at the Regional Landfill to about 244 acres. The remaining area within the facility boundary is set aside for ancillary facilities and buffers (see Drawings, Sheet C-01, Existing Site Conditions). SPSA currently owns a total of 833 acres.

Only municipal, commercial, and certain pre-approved industrial wastes generated within the aforementioned communities are accepted at this Landfill. No hazardous waste is accepted at this site. For a more complete description of anticipated waste types and characteristics, consult the Operations Manual provided in Permit Module II.

Drawing sheets and calculations referenced in this design report are provided in Permit Module III, attachments A-1 and A-2 respectively.

1.2 SITE LIFE CALCULATIONS

The 2007 12-month rolling average disposal rate for municipal solid waste (MSW), construction and demolition debris (CDD), and ash at the landfill was 102,117 tons per month (tpm) which equates to 1,225,405 tons per year (tpy) or 3,928 tons per day (tpd). The in-place density to date of Cells V and VI is 1,701 lb/cubic yard (CY) or 0.85 tn/CY; however an in-place density of 1,540 lbs/cubic yard (0.77 tn/CY) more accurately represents a consistent historic in-place density for Cell V. Therefore, this historic density figure was utilized for determining the remaining site life of Cells V and VI. Based on the 2007 12-month rolling average disposal rate and the historic in-place density, Cells V and VI will reach capacity in June 2012.

The estimated disposal capacity provided by the Cell VII expansion (excluding operational cover) is 10,818,100 (10.8 million) cubic yards at maximum build-out, which is equivalent to 8,330,000 tons based on the historic in-place waste density of 0.77 tn/CY. The estimated site life for the expansion is approximately 5.9 years based on an average daily disposal limit of

4,500 tons per day (see disposal estimations from Part A permit application), and 312 operating days per calendar year.

1.3 ENGINEERING SUPPORT

SPSA retained the services of HDR Engineering, Inc. to prepare the Part B permit application.

SECTION 2.0
SITE CHARACTERISTICS, DEVELOPMENT AND LANDFILL OPERATION

2.1 FLOODPLAIN

The Cell VII Part A permit application stated that the National Floodplain Insurance Rate Map of the City of Suffolk, dated November 16, 1990, shows a portion of Cell VII lies within Zone A, a Special Flood Hazard Area inundated by 100-year floods where no base flood elevations have been determined. HDR subsequently performed a floodplain study that determined that the 100-year floodplain elevation for the Cell VII area is approximately 18.6 feet MSL, which is less than the existing topography of the area. This study was included in the Cell VII Part A application.

A Letter of Map Revision (LOMR) application will be prepared and submitted to the Federal Emergency Management Agency (FEMA) to revise the 100-year floodplain to be outside the proposed facility boundary. HDR will provide VDEQ with a copy of the LOMR application as well as FEMA's approval of the requested LOMR when it is obtained. A floodplain map showing the current 100-year floodplain boundary and the proposed boundary will be included with the LOMR application.

2.2 SITE ACCESS

All facilities will be surrounded on all sides by natural barriers, fencing, or an equivalent means of controlling vehicular access and preventing illegal disposal. Gates will limit each access point, and such gates will be securable and equipped with locks.

Internal roads will be maintained to be passable in all weather by all vehicles. All operation areas and units will be accessible. Roads will be finished with either gravel or asphalt. A wash-down structure currently exists at the Landfill to prevent tracking of mud onto public roads by vehicles leaving the site. Internal roads will be a minimum of 30 feet wide (two 12-foot lanes with 3-foot shoulders) and will not have slopes of more than 10 percent. Small vehicular access roads may be less than 30 feet.

Proposed access roads as depicted by the details on Sheet C-19, Cell VII Section and Details, will be consistent with the existing access roads currently serving the Landfill. The existing access roads have performed very well over the course of time. The good performance and low maintenance of the roads is an adequate demonstration of the ability to withstand heavy vehicle loading.

The total length of roadway from the property line at the end of Bob Foeller Drive to the scales is approximately 270 feet. Additional queuing distance is obtained along Bob Foeller Drive and extends approximately 1,800 feet for a combined 2,070 feet of queuing distance.

SPSA has two inbound scales, one outbound scale, and a scalehouse at the Landfill. The outermost inbound scale has automated services for SPSA's current contracted customers with tare weights. The presence of two inbound scales prevents delays with inbound traffic.

The transfer station located near the entrance to the Landfill services customers delivering processable waste (i.e., waste to burn at SPSA's Waste-to-Energy Plant) and uses transfer trailers to haul non-processable waste from SPSA's other facilities to the Landfill. Instead of exiting the Landfill empty, the transfer trailers are then used to haul processable waste to SPSA's refuse derived fuel plant.

Two 12-foot lanes with 3-foot shoulders will facilitate two-way traffic on the perimeter roads. The locations of the Cell VII perimeter roads are shown on Sheets C-04 and C-05, Phase 1 and Phase 2 Top of Protective Cover. The operational access road within the Landfill will be 30 feet wide to facilitate two-way truck traffic. The operational access road locations will be developed on the fill with branch roads extending from the perimeter roads to the interior. A level area for truck turning will be maintained ahead of the active disposal area. The trucks will come in via the access road, dump their load, turn around, and exit via the access road.

2.3 SHELTER

The existing Administration/Maintenance Building indicated on the plans will serve as the personnel shelter and sanitary facilities location. The building is continuously heated, lighted, and equipped with mobile and permanent communications equipment. An emergency generator is available for use if utilities fail during inclement weather.

2.4 AESTHETICS

As indicated on the plans, the entire perimeter of the site is buffered by substantial natural vegetation. As a result, noise is minimized to far below the noise attenuation limit of 80 dBA at the site boundary. Maintaining daily cover requirements will minimize odor and potential vector problems. An agreement with the City of Suffolk (City) has been executed where the City has the option to take over the site for its own use as a park or similar use, while SPSA will retain the responsibility of monitoring the site during the post-closure period.

2.5 PHASES OF DEVELOPMENT

The construction of Cell VII will be performed in two phases. Phase I comprises the western portion of Cell VII which is contiguous to Cell V. Construction will begin with the excavation of Phase I, followed by subgrade preparation as well as liner, leachate collection system installation and access road development. Construction of Phase II will commence as waste filling of Phase I approaches the grades represented on Sheet C-05, Phase 2 Top of Protective Cover. The operational fill schedule is discussed in Section 8 of the Closure Plan (Permit Module XII).

Support facilities including scalehouse and entrance gate, Administration/Maintenance Buildings, fuel service station, parking areas, and leachate handling system are currently existing facilities at the site.

2.6 LOCATION OF CELLS

The locations and limits of all disposal cells within the Regional Landfill are shown on Sheet C-01, Existing Site Conditions. Cells I through IV are currently in the process of final closure. Cells V and VI are active. Proposed Cell VII lies east of the existing Cell V and north of the existing transfer station.

2.7 BENCHMARKS

The current site benchmark lies on the north side of the active Cell VI. The location, elevation, and coordinates of this benchmark can be found on Sheet C-01, Existing Site Conditions.

2.8 BORROW AND STOCKPILE AREAS

Cell VII will be constructed within an area currently being used as a borrow area for the closure of Cells I-IV and for operational cover for Cells V and VI. As indicated in the Part A application, the Cell VII borrow area will yield approximately 2.4 million cubic yards of material. Borrow operations within the Cell VII are coordinated such that the excavation will conform to the design dimensions of Cell VII. It is anticipated that during Cell VII construction, materials for subgrade fill, geologic buffer layer, protective cover layer, select fill, etc., will be excavated from this borrow area to the extent possible. If supplemental material is needed, it will be obtained from off-site permitted borrow sources. Material used for Cell VII construction will be excavated and placed quickly to the extent possible in order to avoid “double-handling” of materials and to avoid the need for large soil stockpiles. Soil stockpiles, if needed, will be maintained within the Cell VII footprint in areas that have not received liner or in other nearby locations within SPSA property.

Currently, daily cover typically consists of ash disposal from SPSA’s Waste-to-Energy Plant, posi-shell, and non-hazardous contaminated soils. However, when necessary, soil or approved alternate daily cover is used as daily cover as described in the Regional Landfill Operations Manual (Permit Module II). Given the anticipated daily volume consumption of approximately 5,844 CY, the requirement to maintain a minimum of three days of cover material can be satisfied with a stockpile of 3,506 CY assuming a cover-to-waste ratio of 20 percent.

2.9 CELL DESIGN

2.9.1 Sequence of Filling

The proposed sequencing and overall progression for landfilling Cells V, VI, and VII is depicted on the Sheets C-06, C-07, and C-08, Cells V, VI, and VII Closure Schedule. The proposed height for a compacted lift of solid waste is 10 feet as allowed by 9 VAC 20-80-250 §C.2.b. The theoretical cover-to-waste ratio is approximately 20 percent, and the average daily cell volume consumed (waste and cover) is approximately 5,844 CY/day.

2.9.2 Final Contouring

The proposed final grading and drainage plan is presented on Sheet C-09, Final Grading and Drainage Plan. The plan depicts a 3H:1V slope along the majority of the fill area with a minimum slope of five percent on the flatter top area. The overall height of the fill represents a significant change in elevation from the existing conditions; however, the Cell VII expansion is at a lower elevation overall (186 ft MSL) with respect to the proposed final elevations for the existing landfill Cells V and VI (205.5 ft MSL).

Stormwater management, closure, and subsequent use of the site are described elsewhere in this design report as well as in the Closure Plan provided in Permit Module XII.

SECTION 3.0
SITE PREPARATION

3.1 PLAN FOR INITIAL SITE PREPARATION

As part of a preconstruction meeting, as described in Section 1.7.2 of the Construction Quality Assurance (CQA) Plan provided in Permit Module III A-6, the Engineer, CQA Engineer, and Contractor will perform a thorough walk-over of the proposed construction area. The intent of the walk-over will be to visually observe any existing conditions that differ from those described in the geotechnical report. Items that may potentially be of concern include, but are not necessarily limited to, the presence of sinkholes or depressions; ponded water in an unexpected location; areas of unsuitable subgrade (i.e., excessively wet, soft or pumping soils); or other suspicious, unusual, or unexpected conditions. These areas will be photographed, measured, and, if necessary, sampled by the CQA Engineer.

Any areas that do exhibit unexpected conditions will be studied for the probable cause, documented, and rectified by whatever means are necessary and mutually agreed to by the Engineer, Owner, and Contractor.

If any condition is discovered that requires a modification to the design (other than over excavation and replacement of the subgrade), the VDEQ Division of Waste Operations (DW) will be notified of the potential problem and the proposed corrective measure.

The unexpected condition, corrective measures, and impact on the overall construction will be documented and included with the certification document prepared by the CQA Engineer.

Methods used to document the construction of the site are further defined in Section 9.0 of the CQA Plan.

3.2 GENERAL ACTIVITIES

3.2.1 Clearing and Grubbing

The proposed Cell VII limits of construction lie within the proposed facility boundary. Clearing and grubbing is anticipated to be required within the proposed Cell VII waste limits, as are stormwater control features and access roads. Clearing and grubbing will include the excavation and removal of all vegetation including trees not indicated to remain, stumps, brush, vines, hedgerows, heavy growths of grass, downed timber, logs, rotten wood, roots, rubbish, and other debris. Stumps, roots, and other vegetative debris will be removed to a minimum depth of 2 feet below grade. All depressions caused by clearing and grubbing will be filled unless further earthwork or excavation is required and compacted to the density of surrounding material. All material resulting from clearing and grubbing will be disposed of properly.

3.2.2 Topsoil Stripping

Topsoil within the proposed Cell VII disposal area is found at depths ranging from 0 to 10 inches based on the geotechnical report contained in the Cell VII Expansion Part A application. Topsoil will be stripped to whatever depths encountered so that intermingling with underlying subsoil is prevented. Topsoil will be stockpiled on-site in areas as approved by the Engineer.

3.2.3 Site Dewatering

The placement of the Cell VII liner system below the naturally occurring water table will result in the need to perform site dewatering as part of the construction. During excavation, sumps and pumps will be utilized. Once levels are sufficiently drawn down and stabilized, construction of the underdrain, including the geocomposite drain, trenches, and piping, can be constructed. Pumping from the underdrain system will facilitate construction of the remaining liner components.

Anticipated groundwater withdrawal rates for Cell VII range between 1,400,000 to 2,500,000 gallons per month based on Cell V and Cell VI groundwater withdrawal records. Actual groundwater withdrawal rates are dependent upon the hydrogeologic conditions that exist at the site and will be further examined as part of an aquifer test to be performed in Cell VII for the VDEQ Special Exception Dewatering Permit Application.

SPSA has applied for a Special Exception Permit from the VDEQ Office of Groundwater Characterization and Supply for the dewatering of the site. This permit will be attached to Appendix D of the Operations Manual (Module II) once it is issued.

3.2.3.1 Permit No. 417 Site Specific Conditions

SPSA currently operates a groundwater dewatering system for Cell VI as required under VDEQ Permit No. 417 – Site Specific Condition No. I.F.4. In order to deactivate the system, the waste mass within Cell VI must exceed the hydrostatic uplift forces due to the groundwater, which has been previously calculated to be equivalent to a waste mass elevation of 65 feet MSL. However, an updated calculation utilizing Cell VI as-built information and current in-place waste density resulted in a waste mass elevation of 46 feet MSL. Therefore, the groundwater pumping within Cell VI can be discontinued once waste elevations exceed 30 feet MSL.

A similar specific condition existed for Cell V. The groundwater pumping system was discontinued within Cell V after waste elevations exceeded 65 feet MSL.

It is anticipated that a similar specific condition will be issued for Cell VII. Liner uplift calculations contained in Module III A-2 indicate that an average waste mass elevation of 30 feet MSL is required to counteract the liner uplift forces. The groundwater pumps within Cell VII will therefore remain active until this minimum waste elevation is achieved.

3.2.4 Excavation and Grading

Regular excavation will consist of the removal and disposal of materials located on-site including cutting and shaping of slopes necessary for preparation of road beds and landfill subgrades, removing root mat, stripping topsoil, ditch cutting, sediment basin installation, and other related work.

SECTION 4.0
LINER SYSTEM AND FOUNDATION

4.1 LINER FOUNDATION

4.1.1 General

The foundation for the liner system will be a prepared subgrade consisting of in-place materials and suitable off-site material placed and compacted to achieve the design basegrades as depicted by the contours on Sheet C-02, Basegrade Plan. The placement of foundation materials is described in Sections 02220 and 02221 of the Construction Specifications, (Permit Module III A-5) and Section 3.2 of the CQA Plan.

4.1.2 Subsurface Characteristics

The underlying soils within the footprint of Cell VII are described in the Hydrogeologic and Geotechnical Report contained in the Part A Application completed by HDR Engineering, Inc. and dated November 2007. The most recent determination of the high groundwater table is found in the Groundwater Monitoring Plan (Permit Module X).

The engineering characteristics of the foundation soils underlying the proposed Cell VII expansion were based on a total of 14 boring logs (completed across the entire Cell VII footprint), soil laboratory test results, and dilatometer results included in the aforementioned geotechnical report prepared by HDR Engineering, Inc.

A generalized profile of the foundation soils was developed by HDR Engineering, Inc. based on the above data to permit analysis of settlement, slope stability, and bearing capacity of the foundation soils.

In the generalized profile, the upper 200 feet were considered primarily clean to moderately clayey sand. Angles of internal friction and moist unit weights varied for this layer in accordance with the boring logs. Underlying the upper 200 feet was an approximate 100-foot layer of silty to sandy clay followed by sand with trace amounts of clay to silty sandy clay for approximately 200 feet. Finally, the last layer consisted of sand until rock is anticipated to be encountered at a a depth greater than 1000 feet below ground surface.

The surficial soils at the site were identified as part of the Pleistocene Age Sand Bridge Formation. The Pleistocene Age Norfolk Formation underlies the Sand Bridge Formation at the surface. The Miocene to Pliocene Age Yorktown Formation was encountered underlying the Norfolk Formation. The Yorktown Formation soils have been considered to have been preloaded in excess of 9,000 per square feet (psf) by the weight of overlying sediments that have been subsequently eroded based on the geologic history of the Coastal Plain Province.

Owing to the degree of over-consolidation, the formation behaves as an elastic material with settlement occurring proportional to the applied loads.

4.1.3 Engineering Analysis

4.1.3.1 Settlement Potential

Expected settlements of the liner foundation were calculated for a maximum landfill elevation of approximately 180 feet MSL. The soil strata and soil parameters used for the analyses were estimated based on the subsurface information and geotechnical laboratory testing data presented in the Hydrogeologic and Geotechnical Report contained in the Part A application. Supplemental consolidation test data is also referenced in the settlement calculations contained in Permit Module III, A-2. The groundwater was considered to be lowered below the bottom liner system by the subdrainage system in order to evaluate the worst-case scenario. The calculated maximum estimated foundation settlement beneath a sump, the toe of slope, and the center of the proposed Cell VII is 46, 16, and 59 inches, respectively. These maximum settlements would only be realized if dewatering were continued during the entire operation and post-closure of the Landfill. Since dewatering will be discontinued once liner uplift forces are balanced by the weight of the overlying waste, the calculated settlements are a conservative estimate.

The subsurface explorations indicate most of the foundation soils are part of the Yorktown Formation. These soils generally behave as elastic soils. The settlements will occur as the waste is placed within the landfill and in proportion to the height of the waste. Foundation settlements will occur relatively soon after application of the load, and foundation settlements will be essentially complete prior to construction of the closure cap.

4.1.3.2 Bearing Capacity and Stability

Estimates of the bearing capacity of the foundation soils were calculated based on the subsurface information and geotechnical laboratory testing data presented in the Hydrogeologic and Geotechnical Report contained in the Part A application. Supplemental consolidated-undrained triaxial shear strength test data is also referenced in the slope stability calculations. Undrained and drained soil parameters were selected for the fine-grained foundation soils to represent relatively rapid and slow waste loading conditions, respectively, within the landfill. The Part A application for Cell VII indicated that the Landfill is not located within a seismic impact zone, therefore dynamic stability analyses are not required.

The ultimate bearing capacity was calculated as a function of rotational failure within the foundation soils for two filling conditions. The first condition evaluated was an intermediate filling condition where Phase I of Cell VII is filled to capacity as shown on Sheet C-05, Phase 2 Top of Protective Cover, and filling has not started within Phase II. The intermediate stability analyses provided in Permit Module III A-2 show that the minimum factors of safety obtained for bearing capacity under undrained and drained foundation soil conditions are 1.78 and 1.87, respectively, which are greater than the generally accepted minimum factor of safety for landfills of 1.5.

The second filling condition evaluated for ultimate bearing capacity was for Cell VII constructed to maximum elevations as illustrated on Sheet C-09, Final Grading and Drainage Plan. The global stability analyses provided in Permit Module III A-2 show that the minimum factors of safety obtained for bearing capacity under undrained and drained foundation soil conditions are 1.67 and 1.71, respectively, which are also greater than the generally accepted minimum.

The geosynthetic components of the Cell VII bottom liner system can result in relatively weak interface friction values between the geosynthetics that can develop into potential sliding block failure surfaces that must be analyzed for stability. Sliding block stability analyses were performed for both the intermediate and global filling conditions to determine the minimum geosynthetic interface friction angle that will need to be achieved in order to obtain a minimum static factor of safety of 1.50. The sliding block stability analysis for the intermediate filling condition indicated that a minimum geosynthetic interface friction angle of 16 degrees was required to obtain a minimum factor of safety of 1.50 while the global stability analysis indicated that a minimum angle of 21 degrees was required. The construction specifications contained in Permit Module III A-3 therefore require minimum interface friction angles of 21 degrees for all geosynthetic components of the bottom liner system.

Stability analyses were also performed to verify that the proposed 3H:1V operational slope for Cell VII was sufficiently stable with respect to a circular failure surface developing within the waste. The analyses contained in the intermediate stability and global stability analyses show minimum static factors of safety of 1.57 and 1.71 respectively, each of which exceeds the minimum criteria.

The stability of the excavated Cell VII slopes prior to the placement of waste within Cell VII as depicted on Sheet C-02, Basegrade Plan, was also evaluated. The most critical excavated slope was determined to be on the west side of Cell VII where the waste within Cell V will act as a surcharge load that can increase the potential for failure of the excavated slope. The excavated slope stability analyses provided in Permit Module III A-2 indicate factors of safety of 1.56 and 1.69 for undrained and drained soil conditions, respectively, which exceed the minimum criteria.

4.1.3.3 Bottom Heave/Blow-out Potential

To prevent bottom heave or blowout of the liner, it is recommended that engineering controls be implemented to manipulate the groundwater levels. Dewatering should be performed during the construction of the liner and leachate collection system, as well as during operations. Dewatering will continue at least until there is sufficient ballast over the liner to hold it in place. Based upon the uplift forces calculations performed, approximately 46 feet of waste, or elevation 30 feet MSL, will provide a factor of safety of 2.0 against liner uplift. The Owner will notify VDEQ prior to the ceasing of the groundwater removal operation. The uplift forces and additional related calculations of subgrade stability and capacity of the geocomposite underdrain are provided in Permit Module III A-2.

Blowouts of the flexible liner can occur if gas pressures develop beneath the liner in excess of the weight of the liner and any overlying materials. The two sources of gas, which typically contribute to this pressure build-up are methane generated by the decomposition of organic material in the foundation soils and interstitial air that is forced out of the foundation soils by rising groundwater levels. The subsurface exploration did not encounter foundation soils containing significant amounts of organic matter subject to decay. Also, expected fluctuation of the groundwater levels within the foundation soils at this site are not expected to develop any significant volume of air that could result in gas pressures beneath the liner.

4.1.3.4 Laboratory Data

Geotechnical laboratory data for soil samples obtained from the Cell VII area were provided in the Hydrogeological and Geotechnical Report provided within the Part A application. Supplemental laboratory data is referenced within the geotechnical calculations.

4.1.3.5 Subsurface Exploration Data

Subsurface exploration data for the Cell VII area were provided in the Hydrogeological and Geotechnical Report provided within the Part A application. These data are referenced within the geotechnical calculations.

4.2 LINER SYSTEM

Due to the placement of the Landfill subgrade below the water table, an alternate liner design to the standard Subtitle D composite liner was necessary.

The facility bottom and sidewall liner design is based upon a double composite liner system with leachate collection and a groundwater dewatering system. From the top down, the proposed liner and leachate collection system consists of:

- An 18-inch protective cover layer with minimum hydraulic conductivity of 1.2 x 10^{-4} cm/sec.
- A leachate collection system (LCS) consisting of a geocomposite drainage layer with a design hydraulic conductivity of approximately 2.17 cm/sec with a minimum slope of 2 percent (0.02 ft/ft).
- A 60-mil High Density Polyethylene (HDPE) flexible membrane liner (FML).
- A geosynthetic clay liner (GCL).
- A 40-mil HDPE secondary flexible membrane liner (SFML).

- A 12-inch geologic buffer layer (soil liner).
- A secondary groundwater relief/dewatering layer consisting of another geocomposite drainage layer with a hydraulic conductivity of approximately 2.17 cm/sec with a minimum slope of 2 percent (0.02 ft/ft).

Refer to Permit Module III A-7 for a more detailed discussion of alternative liner design.

The components of the liner system shall be installed in accordance with the construction specifications and the CQA Plan.

4.2.1 HDPE Liner Strength Requirements

Several different conditions have been considered in order to adequately demonstrate the strength of the liner material in the proposed design for this cell; they are as follows.

4.2.1.1 Resistance to Deformation Due to Settlement

Cell VII liner strain calculations based on foundation soil settlement estimates are included in Permit Module III A-2. The maximum liner strain was estimated by determining post-settlement liner elongation between the closest points on the subgrade that will experience minimum and maximum settlement. The calculations indicate the maximum anticipated liner strain due to differential settlement is less than one percent which is well within the specified yield strain for both 40 mil and 60 mil textured HDPE geomembrane of 12%.

4.2.1.2 Anchor Trench Design

The liner material is secured at the periphery of the Landfill base by means of a flat run out and followed by insertion of the membrane in an anchoring trench as shown on Sheet C-16, Liner Details. Correct sizing of the trench will prevent pullout of the liner due to anticipated stresses during both during construction and active filling operations, yet also provide for pullout of the liner from the trench before the yield stress of the liner is exceeded. This ensures that damage to the liner system beneath the waste is avoided. The calculations for the design of the anchor trench are included in Permit Module III A-2.

4.2.1.3 Integrity Under Mechanical Stress

An evaluation of the forces that may act on the liner due to equipment during construction has been conducted. During installation of the protective cover layer, only low-ground pressure equipment will be used with a minimum 1-foot depth of material maintained between the liner and the spreading equipment. The calculations reveal that the liner can withstand acceptable equipment loading without developing excessive internal stresses. Liner strain and stress calculations are included in Permit Module III A-2.

4.2.1.4 Resistance to Exposure

The HDPE liner material selected is specifically designed for exposed conditions through the addition of carbon black, which enhances ultraviolet stability. Also, flexible membrane liner possesses a high environmental stress crack resistance. Proper construction techniques should also minimize exposure time. Refer to the CQA Plan and Section 02775 of the Construction Specifications for a description of the placement of protective cover materials to minimize liner exposure.

4.2.1.5 Long-Term Stresses Resulting from the Placement of Wastes

Long-term stresses imposed on the liner material will be caused by liner elongation due to differential settlement of the subgrade soils. A demonstration that the projected long-term stresses will not exceed the yield strength of the liner materials is provided in Section 4.2.1.1 of this design report.

4.2.1.6 Interface Friction Values

Estimates of the friction values between the geosynthetic and soil components of the Cell VII liner system are necessary in order to perform the stability analyses previously described within this design report and provided in the calculations. The friction values were selected from summaries of laboratory test data for similar materials as reported in the Direct Shear Database of Geosynthetic-to-Geosynthetic and Geosynthetic-to-Soil Interfaces (GRI Report #30). Geosynthetic manufacturers' published data and previous test results for materials used at the Landfill were also reviewed to ensure that the published values were appropriate.

The sliding block stability analyses contained in Permit Module III A-2 indicate that textured HDPE geomembrane is required both on the bottom of Cell VII and on the 4H:1V sideslope liner. A minimum friction angle of 21 degrees within the liner system is required to achieve a minimum factor of safety against failure of 1.5. This minimum requirement is reflected in the construction specifications contained in Permit Module III A-5.

4.2.1.7 The Ability of the Geomembrane to Withstand Down-Dragging During and After Waste Placement

The geomembranes within the Cell VII liner system were designed to avoid down-dragging during and after waste placement. This was accomplished by maintaining a minimum interface friction value of 21 degrees for the liner system, providing adequate anchor trench design, and performing sideslope veneer stability analysis. In addition, the Operations Manual contained in Permit Module II limits temporary waste slopes to 3H:1V, which will avoid imposing excessive forces on the liner system during waste placement that could cause geomembrane down-dragging. Supporting calculations demonstrating that down-dragging of the geomembrane will not occur are provided in Permit Module III A-2.

4.2.1.8 The Stability of a Soil Cover/Drainage Material on Top of a Geomembrane

The stability of the protective soil layer on top of the geomembrane on the 4H:1V Cell VII sideslopes is demonstrated by the veneer stability analyses. These calculations indicate that a minimum factor of safety of 1.6 is achieved for veneer stability.

4.2.1.9 Internal and External Pressure Gradients

Internal pressure gradients within Cell VII will be minimized by the leachate collection system which is designed to maintain leachate heads above the liner below one foot.

Measures to ensure that external pressure gradients do not damage the Cell VII liner system are described in Section 4.1.3.3 of this design report. These measures include dewatering the excavation to eliminate hydrostatic uplift forces on the liner system until adequate ballast is provided above the liner by waste to withstand the hydrostatic forces. The uplift forces calculations demonstrate that a minimum waste elevation of 30 feet MSL is required within Cell VII before the groundwater pumps can be deactivated in order to maintain a factor of safety against uplift of 2.0.

4.2.1.10 Stresses Resulting from Settlement

A demonstration that foundation settlement within Cell VII will not induce excessive stresses and strains within the liner system is provided in Section 4.2.1.1 of this design report.

4.2.1.11 Climatic Conditions

According to the USEPA, document EPA530-R-93-017, November 1993, Figure 6-4, “Regional Depth of Frost Penetration in Inches”, the average depth that frost will penetrate the soil in southeastern Virginia is 3 inches. Because the protective soil layers of the liner and final cover systems are 18 inches and 2 feet thick, respectively, freeze/thaw cycles are not expected to impact the integrity of the system.

Section 02775 of the construction specifications also includes limitations on climatic conditions during which geomembrane liner can be installed. These limitations help ensure that liner is not installed during conditions that may be detrimental to the long-term performance of the liner.

4.2.1.12 Installation Stresses

The most critical period with respect to installation stresses on the liner system within Cell VII is when the 18-inch protective cover layer is placed on the 4H:1V sideslopes. It is during this time that maximum forces are applied to the liner system by the spreading equipment. These forces are evaluated in the veneer stability and liner stress calculations contained in Permit Module III A-2 which show that adequate frictional resistance will be provided by the geosynthetic components of the liner system to avoid the development of excess stresses.

4.2.1.13 Operating Stresses

Operating stresses on the Cell VII liner system, other than those due to the static weight of the waste mass, will be limited by the adherence to the provisions of the Operations Manual. These provisions include not allowing disposal and operational vehicles to drive directly on the liner system, using soil platforms over the liner system during the placement of the initial lift of waste, limiting lift heights to 10 feet, removing bulky waste that could damage the liner system from the first lift of waste, and maintaining a maximum waste slope of 3H:1V. The ability of the liner system to withstand the stresses induced within the liner system by the differential settlement of the subgrade caused by the weight of the overlying waste is described in Section 4.2.1.1 of this Design Report.

4.2.2 Coverage

The Cell VII liner will be installed over all areas that will receive waste. The liner limits are shown on Sheet C-02, Basegrade Plan. The liner will extend up the sideslopes of the excavated cell as shown to effectively form a "basin" to contain the waste material and leachate. The liner on the west slope of Cell VII will tie into the Cell V liner in order to allow the filling of the valley between Cells V and VII.

4.2.3 Liner Bedding

Requirements to ensure that suitable bedding is provided for the Cell VII synthetic liner are contained in the Drawings (Permit Module III A-1), the CQA Plan (Permit Module III A-6), and the Construction Specifications (Permit Module III A-5). The purpose of these requirements is to ensure that the subgrade is of uniform material and free of debris that might puncture the liner. Placement of cover material will further protect the liner during operations as previously demonstrated. Protection of the liner to prevent puncture due to the angular leachate collection stone is provided by placement of the geocomposite over the 60 mil HDPE geomembrane.

4.2.4 Liner Subgrade

The ability of the Cell VII subgrade to support the liner system and overlying waste is demonstrated by the bearing capacity stability analyses discussed in Section 4.1.3.2 of this design report.

4.2.5 Installation and Quality Control

Installation and quality control requirements for the Cell VII liner system are included in the CQA Plan and the Construction Specifications.

SECTION 5.0
LIQUIDS MANAGEMENT SYSTEM

5.1 LEACHATE COLLECTION AND CONTROL

5.1.1 General Description

The leachate management system includes all facilities, either existing or proposed, that are required for the collection, storage, treatment, and disposal of leachate generated within the Landfill.

The collection and removal of leachate within Cell VII will be accomplished by a system of perforated HDPE plastic pipe installed within gravel-filled trenches. The leachate collection system will consist of the following components.

- An 18-inch protective cover layer of granular material with a minimum hydraulic conductivity of approximately 1.2×10^{-4} cm/sec.
- A geocomposite drainage layer consisting of an HDPE geonet core with a non-woven geotextile bonded to both sides.
- A network of 8 inch diameter perforated HDPE leachate collection pipes placed in trenches within the protective cover layer. This piping will facilitate: a) removal of stormwater runoff prior to filling operations, and b) removal of leachate after filling operations in each subcell have begun.

The floor of Cell VII is graded to direct generated leachate toward the collection trenches. The design provides for the effective and rapid removal of leachate by allowing it to flow vertically through the protective layer to the geocomposite drainage layer (GDL), laterally through the GDL to the collection trenches, and to the sumps from the perforated pipe within the collection trenches. See Sheet C-15, Liner Details, for a typical collection trench detail. It should be noted that leachate recirculation was included to provide a conservative design in the leachate collection system in the event a Research, Development, and Demonstration Plan is applied for or revisions to the current solid waste regulations are made that will allow leachate recirculation.

5.1.2 Leachate Generation

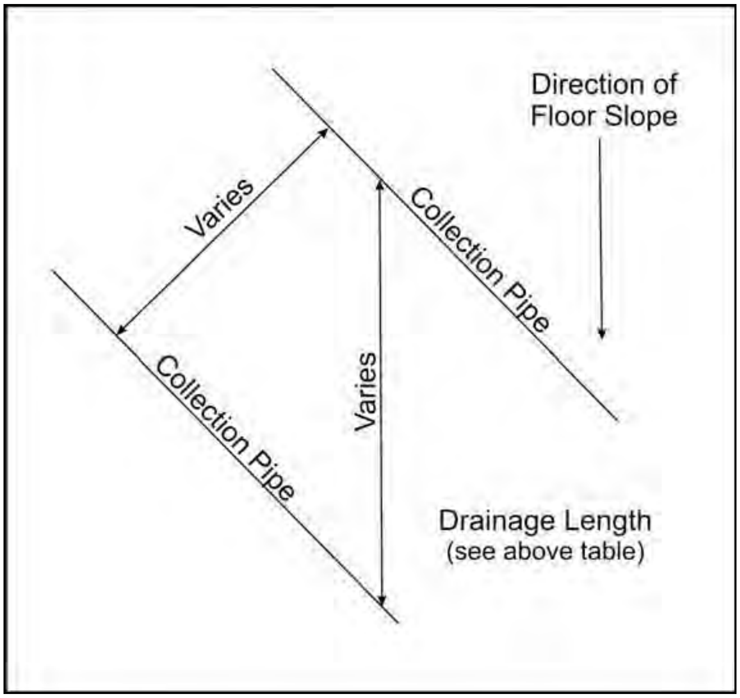
Leachate is generated as a result of the percolation of water through the waste and the compression of the waste under its own load. Several factors affect the quantity of leachate: principally composition of waste, time, ambient temperature, rainfall and runoff potential. Estimation of the anticipated quantity of liquid generated has been divided into six categories.

1. No waste or "open" condition.
2. Initial 10' lift without leachate recirculation.
3. 20' of waste with 100% leachate recirculation.
4. Intermediate cover on sideslopes with open top at elevation 170 feet MSL without leachate recirculation.
5. Intermediate cover on sideslopes with open top at elevation 170 feet MSL with 100 percent leachate recirculation.
6. Final cover at full build out without leachate recirculation.

The Hydrologic Evaluation of Landfill Performance (or "HELP") Model was used to simulate the different cases. The HELP Model output can be found in Permit Module III A-2. The following assumptions and/or information were used in the computer model.

- Precipitation data – Norfolk, Virginia (default data) with the adjustment for 25-year, 24-hour storm event manually input into the precipitation data set (6.5 inches of precipitation).
- Base liner slope – 2.5 percent.
- Leachate collection pipe spacing for open cell (265 feet used conservatively)

Sump Number	9	10	11	12	13
Actual length perpendicular to slope	260.05	260.05	257.31	237.59	237.59



- Geocomposite drain used as the leachate collection layer.
- Protective cover layer permeability of minimum 1.2 x 10-4 cm/sec.
- All layers start at field capacity (conservative assumption initialized by program).

The quantity of leachate drained from the LCS and the peak head under the various conditions evaluated is summarized by the following table.

Table 5.1-1 SPSA Cell VII Expansion Leachate Generation Rates as Determined by the HELP Model

Condition	Peak Daily Drainage		Average Annual Drainage		Maximum Head on Liner (inches)
	Cubic Feet /acre/day	Gallons /acre /day	Cubic Feet /acre/year	Gallons /acre /year	
No Waste/ Open Condition	14,817	110,839	60,198	450,312	.56
Initial 10' Lift w/o Recirculation	1,334	9,979	53,352	399,101	0.05
20' of Waste w/ 100% Recirculation	4,137	30,947	430,284	3,218,748	0.16
Int. Cover Sideslopes w/ Top @ 170' Elev. w/o Recirculation	598	4,473	44,016	329,263	0.28
Int. Cover Sideslopes w/ Top @ 170' Elev. w/o 100% Recirculation	957	7,159	105,133	786,449	0.44
Final Cover (closed) w/o Recirculation	0.009	0.067	0.142	1.062	.007

The maximum head on the liner, 0.56 inches, occurs during the open condition prior to filling after the manually input 25-year, 24-hour storm event and is well below the 12-inch regulatory limit. Based on experience, the HELP Model is typically conservative in estimating leachate flow rates. One possible reason is that the program initializes the water content of the waste to be above the field capacity. This is done to represent steady-state conditions within the waste; however, it does not account for dry pockets of waste that have water content less than the field capacity. The moisture absorbing capacity of compacted waste is well documented in literature. Therefore, these flow rates should be considered conservative and representative of the worse case scenario.

During operations, data on leachate flow rate will be gathered in accordance with the discharge permit. If the rates are high on a consistent basis, then measures will be employed to promote stormwater runoff and limit leachate generation. Such measures may include installation of an interim cap consisting of 6 inches of soil and a 20 to 30 mil geomembrane.

5.1.3 Leachate Flow Data

Leachate flow data for existing Cells I-VI from March 1999 to April 2008 as well as a summary of total monthly flow rates and precipitation can be found in Permit Module III A-2. The monthly leachate flow measurements were taken from a flowmeter on a force main discharging leachate from the leachate lagoons to the Hampton Roads Sanitary District. The data obtained from these measurements have been compared to the predicted flow rates for the active cells. As anticipated, the HELP Model predictions were conservative by predicting substantially more leachate flow than was observed measured by the flowmeter.

5.1.4 Leachate Collection System

5.1.4.1 Geocomposite Drainage Layer

The leachate collection system (LCS) drainage layer will be a high transmissivity geocomposite material consisting of a geosynthetic drainage media (geonet) with a thermally bonded, needle-punched, non-woven geotextile on both sides. This geocomposite drainage layer (GDL) will serve to effectively remove leachate and limit head buildup on the liner system. The material requirements and installation procedures are described in the CQA Plan and Construction Specifications.

The selection of the GDL has taken into account factors that can decrease the flow capacity of the material over time such as creep, chemical clogging, and biological clogging. Geocomposite capacity calculations demonstrating that the GDL will provide sufficient long-term flow capacity are included in Permit Module III A-2.

5.1.4.2 Filter Layer

The upper non-woven geotextile component of the geocomposite drainage layer will act as a filter layer between the geonet and the protective cover layer. The same non-woven geotextile will also be used as a filter between the drainage stone and protective cover layer in the leachate collection trenches. The clogging of the geotextile has been evaluated using methods described in "Geotextile Aspects of Landfill Design and Construction" by Qian, Koerner,and Gray (2002). Based on these methods and associated calculations, long-term clogging of the filter layer should not adversely affect the functioning of the LCS.

5.1.4.3 Placement of Protective Cover

All lined areas will be covered with a protective soil cover layer consisting of 18 inches of soil with a minimum hydraulic conductivity of 1.2×10^{-4} cm/sec. This cover material will be free of vegetation, sticks, shells, refuse, or other organic matter, and will be placed as soon as possible after installation of the liner and geosynthetic drainage layer to prevent physical damage. The protective cover layer will be spread in such a manner as to prevent damage to the underlying geosynthetics from either equipment or workmen.

At no time will any piece of equipment used to place the protective cover be allowed to come in direct contact with the exposed geosynthetic components.

Placement will begin by ramping in with material from the corner of the cell. Low ground pressure (LGP) dozers will be used to spread the material. A minimum thickness of 12 inches will be maintained between the liner and the tracks of the spreading equipment. The drainage material will be end-dumped onto previously placed material and then spread out by the LGP dozers. The CQC Consultant will observe that the placement of drainage materials is not causing excessive wrinkling or other damage to the synthetic liner. The CQA Consultant will once again confirm adequate thickness by measuring soil thickness at a minimum of eight survey points per acre. A representative of the CQC Consultant shall observe the top of the completed drainage layer for a smooth, uniform surface free of depressions or high spots. Additional details are provided in the CQA Plan and Construction Specifications.

5.1.5 Leachate Collection Pipe Network

The piping system consists of a series of 8-inch HDPE pipes designed to collect leachate from the drainage layer (see Construction Specifications Section 15064). The lateral spacing of pipes varies as shown on Sheet C-03, Modifications Plan. The lateral pipes drain into header pipes installed at the toe of the slope, which in turn drain toward one of five sumps located within Cell VII. The minimum slope of the subgrade to the collection trench is 2.5 percent. The leachate collection system was designed so that no more than 1 foot of leachate may accumulate above the liner.

Each leachate collection pipe will have three rows of 1/4-inch diameter holes at 120 degree angles, longitudinally spaced 4 inches apart. The design calculations for the leachate pipe perforation size and spacing are included in Permit Module III A-2.

The leachate collection pipe network was designed to maintain a minimum post-settlement slope of 0.54 percent. The calculations demonstrate that this slope will provide more than adequate flow capacity.

Leachate collection for Cell VII is achieved by draining approximately half the cell to the north and half to the south. At the terminus of each collection line is a riser for cleaning out the leachate collection laterals and headers which is supported at the top of the slope by a cast-in-place concrete anchor.

The collection system is also designed to remove stormwater from the cell prior to the commencement of filling operations.

5.1.6 Groundwater Collection Piping

5.1.6.1 Piping Network

An underdrain system for the collection of groundwater will be installed within Cell VII prior to the installation of the liner system. The underdrain system will consist of a network of 6-inch (nominal) perforated SDR 11, HDPE pipe laterals spaced at varying intervals draining to the north and south of the cell. The purpose of the underdrain system is to lower the water table within Cell VII below the liner system in order to facilitate construction and prevent hydrostatic uplift forces from acting on the liner until sufficient waste is within the cell to balance these forces.

Each perforated underdrain pipe will have three rows of 1/4-inch diameter holes at 120 degree angles, longitudinally spaced 4 inches apart. The design calculations for the groundwater pipe perforation size and spacing are included in Permit Module III A-2

The minimum post-settlement slope of the underdrain piping will be 0.54 percent. The lateral underdrain pipes convey flow to the groundwater collection header located along the toe of slope. Similar to the leachate collection system, the header pipes drain toward the low point (sump) positions within the cell in each corner. The groundwater collection sumps will be constructed beneath the leachate collection sumps.

5.1.6.2 Handling and Discharge of Liquids

It is anticipated that the groundwater pumped from the Cell VII underdrain system will not exceed the maximum contaminant level (MCL) requirements of Appendix 9.1 of the Virginia Solid Waste Management Regulations (VSWMR) and will be deemed safe to discharge to the stormwater control system. The sampling and analysis requirements for the groundwater are described in more detail in the Groundwater Monitoring Plan provided in Permit Module X.

Uncontaminated groundwater removed from Cell VII will be discharged to a perimeter drainage channel where it will be directed to one of two sediment basins that will be installed as part of Cell VII construction. Following treatment within the sediment basins, the groundwater will be discharged off-site. The locations of the perimeter drainage channels and sediment basins for Cell VII are shown on Sheet C-02, Basegrade Plan.

SPSA currently possesses a Virginia Pollution Abatement permit (VPA 010145) for the stormwater pond to the south of Cell V. In addition, a general stormwater permit (VAR350120) exists for the entire property.

According to Virginia Solid Waste Management Regulations, if the groundwater pumped from the Cell VII underdrain system is found to be contaminated, it will be handled as leachate and transferred to the on-site leachate holding lagoons or proposed storage tank prior to discharge to the Hampton Roads Sanitary District (HRSD).

5.1.7 Sideriser and Force Main Piping

The leachate collection system for Cell VII includes five submersible-type leachate pumps, one per low-point, installed at the locations shown on Sheet C-03, Modifications Plan. These pumps will be mounted inside a 24-inch diameter HDPE sideriser, which allows easy removal for operation and maintenance. An integral transducer mounted on each pump signals the unit to operate and transfer leachate to the on-site equalization lagoons or proposed leachate tank. Under normal operations, the liquid level is maintained at less than 1 foot above the membrane liner (except in the sump areas). Additional information pertaining to the submersible pumps is provided in Section 11095 of the Construction Specifications.

The five pumps will transfer leachate via HDPE piping (force main) located along the perimeter of Cell VII to a new pump station that will be located at the northwest corner of Cell VII. From the new pump station, the leachate will be transferred by force main to the on-site leachate holding lagoons or the proposed leachate holding tank. All leachate piping systems are designed for periodic flushing to remove any settled debris or other pipe restrictions. The locations of the proposed leachate pump station and force mains are shown on Sheet C-10, Leachate Collection System.

The submersible leachate pumps will be equipped with transducers, which can be set to turn on and off at particular leachate levels as well as to signal a high level alarm. In the event of a power failure, a portable battery-powered, water level indicator can be positioned down the riser pipe to determine the liquid level.

Five submersible groundwater pumps will be installed within the groundwater sumps of Cell VII. The controls for these pumps will be similar to that described for the leachate pumps. The groundwater will be pumped through 24-inch diameter HDPE siderisers where it will normally be discharged to the perimeter drainage channel. In the event that the groundwater is determined to be contaminated, it will be transferred to the existing leachate holding lagoons or proposed holding tank via the proposed leachate pump station and force main system.

5.1.8 Pipe Strength

5.1.8.1 HDPE Leachate and Groundwater Collection Piping

The HDPE pipe systems have been designed to account for both the loading due to the waste and cover soils as well as the bedding conditions within the Landfill. The design calculations for percent deflection, wall buckling, and crushing are presented in Permit Module III A-2.

5.1.8.2 Sideriser Piping

The sideriser piping will be a 24-inch SDR 17 HDPE solid pipe as depicted on Sheets C-16, Liner Details, and C-17, Leachate Management Details. The design calculations for percent deflection, wall buckling, and crushing under the imposed loads are presented in Permit Module III A-2.

5.1.9 Chemical Resistance

Materials to be used in the collection of leachate must possess a very high degree of chemical resistance. Of chief concern is the corrosive nature of leachate. HDPE materials are typically used for leachate piping due to their high chemical resistance and adequate strength. The HDPE synthetic liner is likewise very resistant to leachate, as documented by many years of satisfactory performance at hundreds of landfills within the United States.

5.2 LEACHATE PUMPING

5.2.1 Existing System

The existing leachate system for Cells I through IV includes leachate collection pipes underneath the Landfill that provide gravity drainageto manholes on the east and west sides of the existing Landfill. These manholes drain to the existing leachate pump station located to the north of Cells I through IV. The pump station includes two centrifugal 400 GPM pumps which pump the raw leachate to the existing lined lagoons. The first lagoon includes four 15 HP floating aerators. After aeration, the leachate flows by gravity through a holding lagoon and back to the existing pump station (into a separate wet well with two centrifugal 250 GPM pumps) where it is then pumped to the HRSD wastewater treatment facilities for final treatment.

The Cell V leachate system includes perforated leachate collection pipes underneath the Landfill, which drain to gravity headers, which run along the north and south sides of Cell V, and then to low point sumps in each corner. Leachate is extracted from the sumps by submersible pumps that transfer it via HDPE force main to the Cell V leachate pump station located near the southeast corner of Cell V. In addition to the leachate from Cell V, the Cell V pump station takes sanitary flows from the administration building, tire shredder, ferrous recovery facility, transfer station, and Cell VI. Cell V was constructed with a 4-inch force main that drains to the Cell V pump station. A 6-inch force main is used as the discharge line for the pump station to the lagoons. At the corner of Cell I, the 6-inch line increases to 8-inch diameter force main and continues under pressure to the aerated lagoon where the leachate is treated and discharged to the wastewater treatment plant as previously described for Cells I through IV.

The Cell VI leachate system includes perforated leachate collection pipes underneath the landfill, which drain to gravity headers that run along the north and south sides of Cell VI. The headers drain to low point sumps located at each corner of Cell VI where submersible pumps transfer the leachate via HDPE force main to the Cell V leachate pump station where it is pumped to the leachate lagoons as previously described for the Cell V leachate system.

5.2.2 Proposed Cell VII Pumping

The proposed Cell VII leachate system includes perforated leachate collection pipes underneath the landfill, which drain to gravity headers running along the north and south sides of Cell VII and then to five low point sumps. The low point sumps will contain submersible pumps for pumping leachate to the existing leachate lagoons and proposed leachate tank

The construction of Cell VII will require that a portion of the existing force main that runs from the Cell V leachate pump station to the leachate lagoons be abandoned since it is located in an area that will be overlain by waste. A new leachate pump station will therefore be constructed at the northwest corner of Cell VII and all leachate collected from Cells V, VI, and VII will be pumped to the new pump station via HDPE force main. The new force main will transfer leachate to the existing leachate lagoons and proposed leachate tank. It is anticipated that the existing Cell V pump station will be kept in operation as a means of collecting leachate and wastewater from the transfer station and other facilities located near the entrance to the landfill. Modifications will be made to pump this wastewater from the Cell V pump station through the leachate force main servicing Cells V and VI to the new leachate pump station.

5.2.3 Pump Station Sizing, Design, and Operation

The new pump station that will be constructed at the northwest corner of Cell VII will be designed in accordance with the Virginia State Water Quality Board Regulations. The pump station will include two submersible type pumps. These pumps will be capable of transferring the design leachate flows from Cells V, VI, and VII to the existing leachate lagoons and proposed leachate storage tank and will automatically alternate each time a pump is activated. The system will include alarms for power outage, high level, and no-flow conditions. A flowmeter and chart recorder will be included to verify leachate production.

The existing pump stations (Cell V and at the leachate lagoons) will continue to be operated by SPSA landfill staff. The new leachate pump station will also be operated by SPSA landfill staff. SPSA staff will inspect the pump stations daily to identify any problems or maintenance required, and also to document pumped quantities.

5.3 LEACHATE PRETREATMENT

5.3.1 Existing System for Cells I-VI

The existing system consists of two synthetically lined lagoons. Each lagoon holds about 800,000 gallons total volume. One lagoon is aerated with four 15 HP aerators, while the other secondary lagoon is used as a holding pond. The original design basis is for 70,000 gpd average leachate flow and 150,000 gpd peak flow. BOD_5 was based on a minimum estimated value of 1,600 mg/l, and a maximum of 3,200 mg/l. The pretreatment permit through HRSD (see Appendix D of the Operations Manual), requires a maximum BOD concentration of 250 mg/l BOD prior to release to the wastewater treatment plant.

Leachate is sampled from the lagoons on a monthly basis and the results of the analyses are reported to HRSD. Leachate analytical data from fiscal year (FY) 2007-2008 are included in Permit Module III A-2. Due to the consistency of the results, this data should provide a representative example of the leachate quality anticipated to come from Cell VII. Additional leachate quality data is available upon request. Permit Module III A-2 also contains a summary of the leachate quantities for FY 2007-2008.

5.3.2 Current and Proposed Operations

The FY 2007-2008 average flow through the leachate pretreatment system was approximately 1,073,000 gallons per month. The effluent from the lagoons consistently meets the pretreatment limits, without having to use all four of the floating aerators.

The addition of Cell VII, however, will require an increase in the leachate holding capacity of the site to allow for the storage of leachate generated during peak flow conditions. The leachate stored within the tank will gradually be released through the pretreatment system in accordance with the HRSD permit. Calculations demonstrating that the tank was adequately sized for the anticipated quantity of leachate generated at the site after Cell VII construction are included in Permit Module III A-2.

Based on the reduced leachate quantities produced by the existing landfill due to the closure of Cells I – IV, and the consistent quality of the effluent leachate from the lagoons, the Cell VII design includes no modifications to the existing leachate pretreatment system beyond the increase in holding capacity provided by the proposed leachate tank. As future operational data are reviewed, modifications would be proposed to the leachate system as required.

5.3.3 Leachate Storage Capacity

Cell VII HELP Model results presented in leachate generation rate table in Section 5.1.2 of this design report and historical leachate discharge quantities for the site were used to estimate the required leachate storage capacity for the landfill after Cell VII is constructed. VDEQ requires that seven days of leachate storage volume must be provided.

Inspection of the Cell VII development plans indicate that maximum leachate production is expected when Phase 1 is operating with 100 percent leachate recirculation and filling of waste just begins within Phase 2 such that any rainfall that occurs within Phase 2 must be collected as leachate. At that time, it is assumed that Cells I-IV will be closed and Cells V and VI will be almost filled to capacity with intermediate cover on the sideslopes but an open top where active filling is taking place. Based on these assumptions, the leachate storage volume calculations provided in Permit Module III A-2 indicate that an average daily leachate generation rate of 1,502 gallons per acre (approximately 363,000 gallons) is anticipated.

The historical leachate discharge quantities for the site included with the calculations, however, indicate a maximum daily discharge rate of 1,171 gallons per acre (approximately 283,000 gallons). This indicates that the HELP Model significantly overestimates leachate generation at the site.

The required leachate storage capacity after Cell VII is constructed was therefore estimated using one day of the average daily leachate flow predicted by the HELP Model and six days of the maximum daily leachate flow based on the historical records for a total required leachate storage capacity of approximately 2,091,000 gallons. Since the two existing leachate lagoons provide a total of approximately 1,600,000 gallons, the proposed leachate tank will have to provide approximately 500,000 gallons of additional capacity. The proposed leachate tank will have secondary containment consisting of another tank, concrete system, or a lined embankment system.

5.4 STORMWATER MANAGEMENT

5.4.1 Design Basis

Methods described in "Elements of Urban Stormwater Design", by H. Rooney Malcom, P.E. and the Virginia Erosion and Sediment Control Handbook were used in the overall analyses of runoff from the Cell VII drainage area. Stormwater calculations were based on Sheet C-09, Final Grading and Drainage Plan, which represents the condition during the life of Cell VII that will generate the most stormwater runoff. The overall area draining to the two proposed sediment basins has been broken down into several subareas along the drainage divides.

The rational method was utilized in determining peak runoff of channels, sideslope channels, and downchutes as indicated in the stormwater calculations.

Analysis was completed, using Hydroflow Hydrographs, to size culverts in the proposed perimeter channel. The entire perimeter channel was assumed to act as a pond with multiple discharge points. This calculation, along with all other stormwater calculations can be found in Permit Module III A-2.

In order to predict the anticipated annual soil loss and erosion potential, the Universal Soil Loss Equation was used. This calculation is also included in Permit Module III A-2.

5.4.2 Run-on Control

Various controls will be used to control run on from entering the Cell VII footprint. A perimeter road will be constructed along the north, east and south sides of Cell VII. The elevation of this road will be higher than the surrounding ground elevation and therefore will prevent run-on into Cell VII on these sides. Run-on diverted from Cell VII will be directed to the natural drainage system to the north, a relocated drainage channel to the east, and the drainage system for the transfer station to the south.

Run-on from the existing landfill (Cell V) to Cell VII will be controlled by using the existing stormwater management system to the extent possible. Stormwater from the existing cells will be directed to the existing perimeter stormwater channels which will direct it away from Cell VII.

Additional run-on control structures within the footprint of Cell VII that will direct stormwater away from the operational face include temporary diversion ditches and/or interphase berms placed across the upland areas from the active fill area. These temporary devices will prevent run-on from either undeveloped areas or previously filled and covered areas from discharging onto the active portion of the cell..

The locations and details of the proposed stormwater control devices are shown on the drawings in Permit Module III A-1. The associated calculations are included in Permit Module III A-2.

5.4.3 Stormwater Control

A system of terraces and downchutes are proposed in order to control stormwater runoff across the completed Cell VII final cover as depicted on Sheet C-09, Final Grading and Drainage Plan. The terraces are spaced at a maximum distance of 120 feet (less than the 200 feet recommended by VESC Handbook to limit erosion) and are sloped at a three percent to ensure they remain effective if differential settlement should occur. It is anticipated that the terraces will be grass lined. The exterior side slope of the perimeter berm will have erosion control matting to minimize erosion potential and washout.

The downchutes may be Reno mattresses filled with riprap and placed across the channel with a series of concrete blocks to slow down the flow (see Sheet C-20, Cells V-VII Drainage Details). The downchutes will discharge to the Cell VII perimeter channels. The perimeter channels in turn carry the flow to culverts, which then discharge into the two sediment basins proposed for Cell VII.

The stormwater controls have been designed in conformance with VESC Handbook (Third Edition, 1992). The sedimentation basins have been designed to attenuate and control the peak flow resulting from the 24-hour, 25-year storm event.

SECTION 6.0

LANDFILL GAS MANAGEMENT PLAN

A Landfill Gas Management Plan for the SPSA Regional Landfill, including the Cell VII expansion, is provided in Permit Attachment II-2 of this permit application.

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ATTACHMENT III-1
Design Drawings

SPSA

HDR Engineering, Inc.
3733 National Drive, Suite 207 | Raleigh, NC 27612

Part B Application Plans For

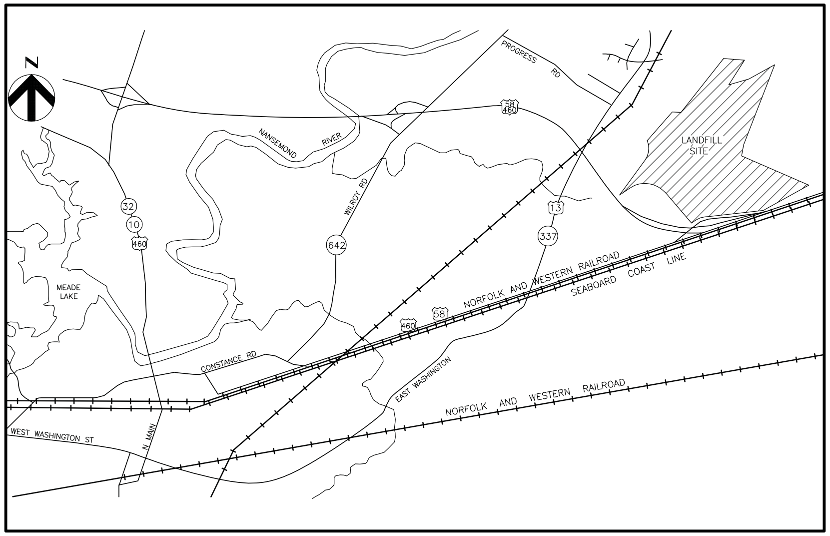
Regional Landfill Cell VII Expansion

REGIONAL SOLID WASTE AND
RESOURCE RECOVERY PROJECT

Issued for Approval
August 2008
Revised July 2009
Revised April 2010

Project No.
000000000002889.018

SUFFOLK, VIRGINIA



LOCATION MAP
1" = 2000'

INDEX OF DRAWINGS

GENERAL

CIVIL

DOUGLAS TRISTAN DECESARE
Lic. No. 38558
8-27-08

THOMAS M. YANOSCHIK
Lic. No. 043303
3/27/08

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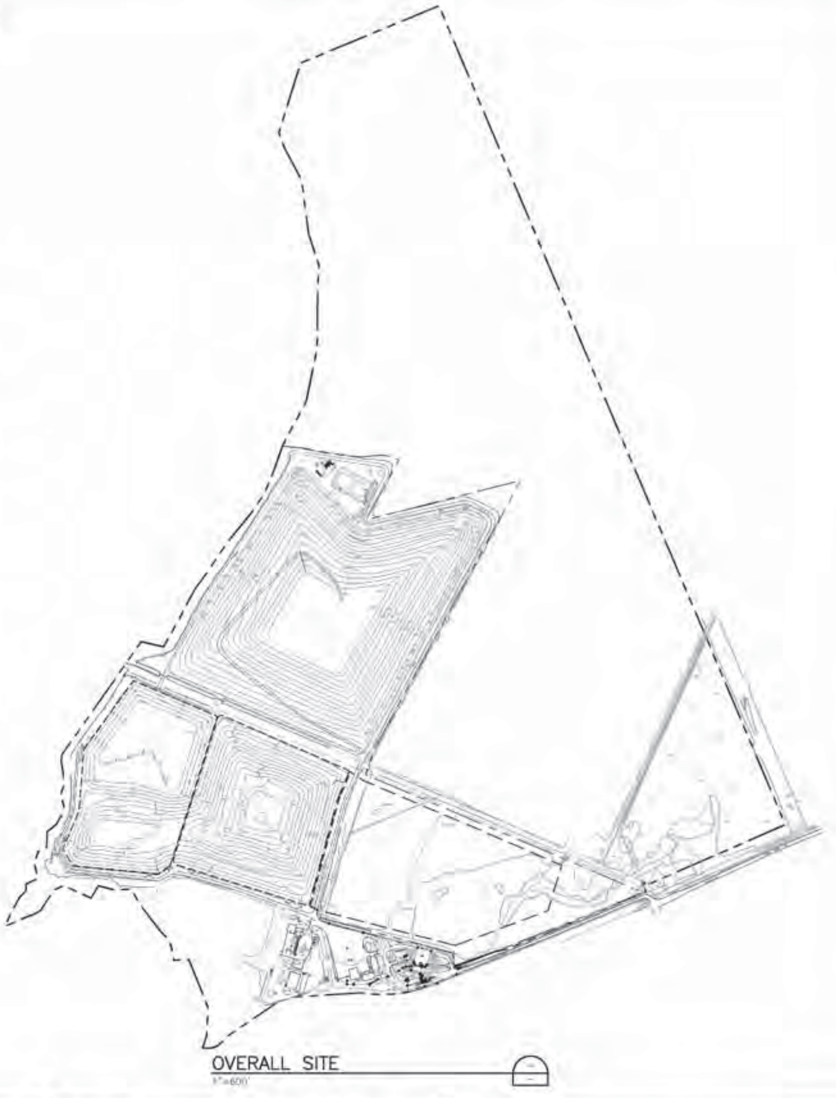
GENERAL LEGEND

— — — 20 — — —	EXISTING CONTOUR
——— 20 ———	PROPOSED CONTOUR
——— – – ———	FACILITY BOUNDARY (APPROXIMATE)
═ ═ ➡ ═ ═	SEDIMENTATION AND DRAINAGE CONTROL CHANNEL
——— – ———	COMMONWEALTH NATURAL GAS PIPELINE EASEMENT
▼	CONTROL MONUMENT
● (17)	MANHOLE STRUCTURE AND IDENTIFICATION
MW-1	GROUNDWATER MONITORING WELL
	PROPOSED SPOT ELEVATION
- - - - 18 - - - -	GROUNDWATER CONTOUR
CP-1	CONTROL POINT
———●———	PROPOSED PIPE WITH MANHOLE
——— – – ►——	LEACHATE COLLECTION PIPE (INDICATING FLOW DIRECTION)
====	CULVERT
	CULVERTS WITH ENDWALLS/HEADWALLS
☐	DROP INLET STRUCTURE (AND ELEVATIONS)
1 / C-3	DETAIL: DETAIL NO. SHEET NO. DETAIL IS DRAWN ON

GENERAL NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL RESTORE TO THE OWNERS SATISFACTION ALL AREAS DISTURBED BY CONSTRUCTION; INCLUDING PERIMETER ROADWAY SURFACES, ROADWAY SHOULDERS AND DITCHES, DRAINAGE STRUCTURES, AND OTHER EXISTING FEATURES.
3. ELEVATIONS REFER TO USGS DATUM. HORIZONTAL CONTROL BASED UPON VIRGINIA STATE PLANE COORDINATE SYSTEM.
4. THE CONTRACTOR SHALL OBTAIN ALL PERMITS AND APPROVALS PRIOR TO COMMENCING WORK.
5. THESE PLANS PRESENT CONSTRUCTION DETAILS OF SELECTED EARTHWORK (GRADING AND DRAINAGE), PLACEMENT OF GEOSYNTHETIC MATERIAL (LINERS AND GEOTEXTILE) AND STONE, PIPING, AND OTHER MISCELLANEOUS CONSTRUCTION. THE CONSTRUCTION SHOULD STRICTLY ADHERE TO THE FACILITY PERMIT (NO. 417), LATEST AMMENDMENT.
6. THESE DRAWINGS ACCOMPANY AND ARE PART OF THE TECHNICAL SPECIFICATIONS.
7. ANY CONFLICTS BETWEEN THESE PLANS AND THE PERMIT (DESIGN) SHOULD BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER (HDR ENGINEERING, INC.).
8. UNLESS OTHERWISE NOTED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENTATION CONTROL PRACTICES SHALL BE IN ACCORDANCE WITH "MINIMUM STANDARDS AND SPECIFICATIONS" OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), 3RD EDITION, 1992.
9. RESTORE AND STABILIZE ALL DISTURBED AREAS INCLUDING STOCKPILES AND STORAGE ARES. PERFORM PERMANENT SEEDING IN ACCORDANCE WITH VESCH STANDARDS AND THE PROJECT SPECIFICATIONS.
10. ALL STORM WATER MANAGEMENT AND EROSION CONTROL MEASURES SHALL BE INSTALLED AND MADE OPERATIONAL PRIOR TO COMMENCEMENT OF EARTHWORK AND TRENCHING ACTIVITIES.
11. ADDITIONAL TEMPORARY DITCHES AND/OR DIVERSIONS MAY BE REQUIRED IN ORDER TO FACILITATE CONSTRUCTION. WHERE SUCH MEASURES ARE REQUIRED, THEY SHALL BE CONSTRUCTED SO AS TO DIRECT RUNOFF FROM DISTURBED AREAS TO SEDIMENT BASINS.
12. PERIODIC INSPECTION AND REQUIRED MAINTENANCE OF EROSION CONTROL MEASURES SHALL BE PROVIDED BY THE CONTRACTOR. PERIODIC INSPECTION SHALL BE DEFINED AS AFTER EACH MAJOR RAINFALL EVENT OR WEEKLY, WHICHEVER IS MOST FREQUENT.
13. ANY ERODED MATERIALS SHALL BE PROMTLY REMOVED FROM ROADWAYS, DRIVES, WALKS, DITCHES, WATER COURSES, DRAINAGE CULVERTS, AND/OR STRUCTURES.
14. SILT FENCE, STRAW BALE BARRIERS, ETC. SHALL BE CHECKED REGULARLY FOR UNDERMINING OR DETERIORATION. CONTRACTOR SHALL REPLACE AS REQUIRED.
15. ALL TEMPORARY EROSION CONTROL AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED UPON SATISFACTORY COMPLETION OF WORK AND SITE STABILIZATION.



OVERALL SITE
1"=600'

HDR
HDR Engineering, Inc.
of the Carolinas
3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
B	02/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER D.T. DECESARE, P.E.
T.M. YANOSCHAK, P.E.
G.M. WILLIAMS, E.I.
PROJECT NUMBER 00002889.018

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK **VIRGINIA**

LEGEND AND NOTES

0 1" 2"
FILENAME 00G-02
SCALE 1" = 600'
SHEET **G-02**

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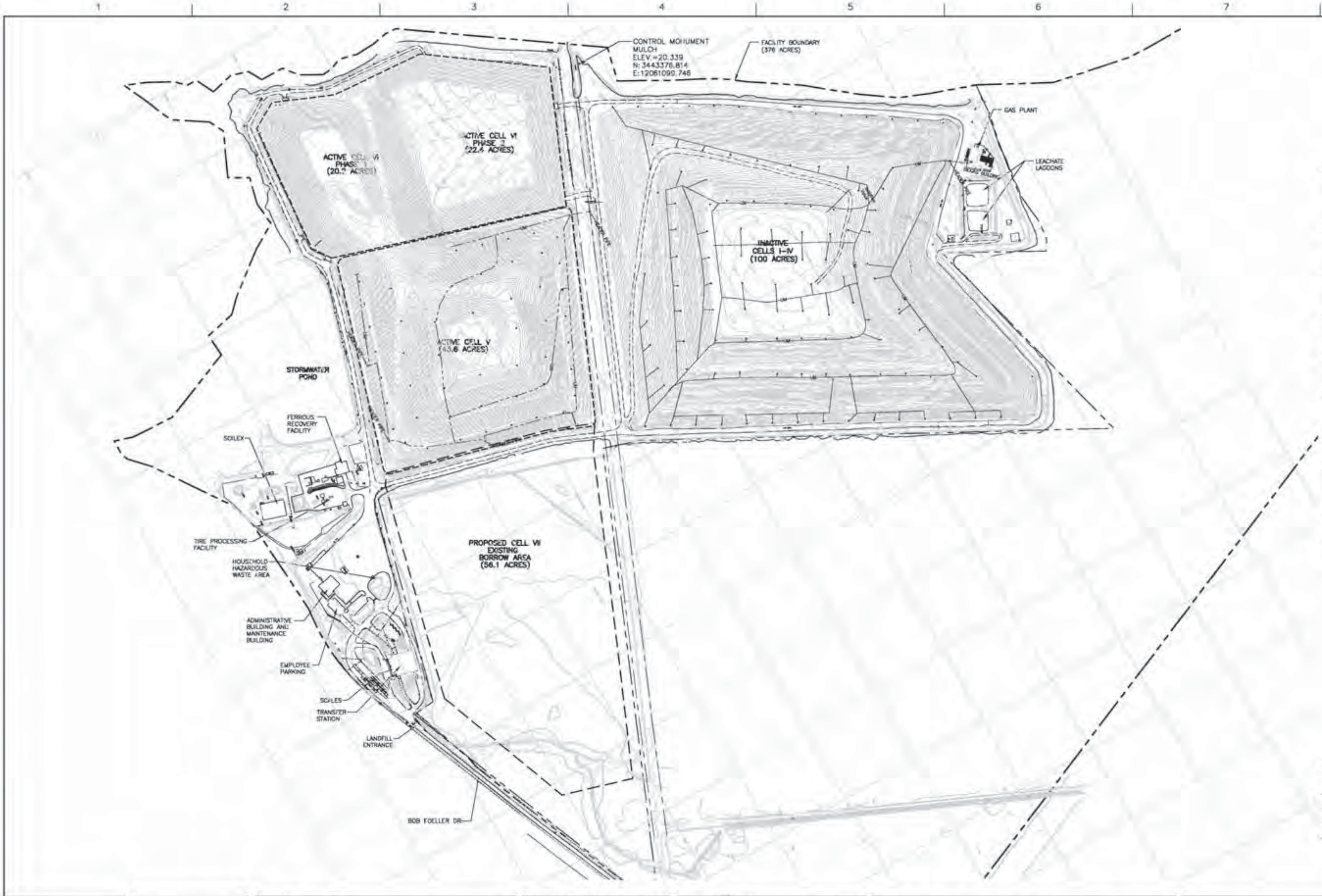

NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I-IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I-IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I-IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED DECEMBER 27, 2007.
5. AS-BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL-SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
7. AS-BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PROFFITT DATED SEPTEMBER 19, 2005.
8. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
9. THE BUFFERS OUTLINED IN 9VAC 20-80-250 A(7) WILL BE MAINTAINED.
10. THE CONDITIONS SHOWN AS EXISTING ON THIS DRAWING REPRESENT GENERAL CONDITIONS AT THE TIME OF THE SURVEYS REFERENCED HEREIN.

LEGEND

- EXISTING CONTOURS
- PROPERTY BOUNDARY
- GAS EASEMENT
- FACILITY BOUNDARY
- CONSTRUCTION BASELINE

HDR

HDR Engineering, Inc.
of the Carolinas

3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
B	02/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

EXISTING SITE CONDITIONS

0 1" 2"

FILENAME	00C-01.dwg	SHEET
SCALE	1"=300'	C-01

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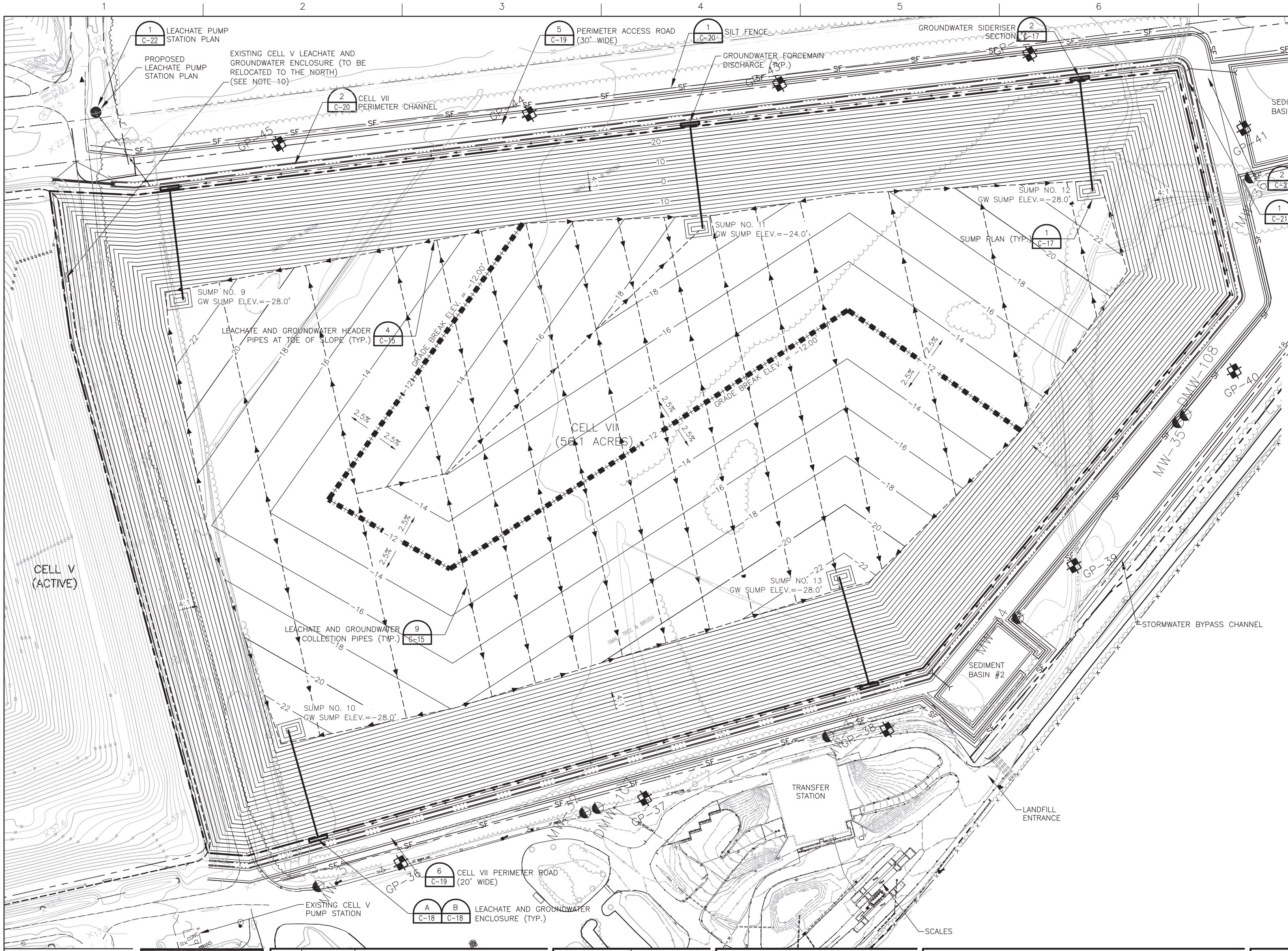
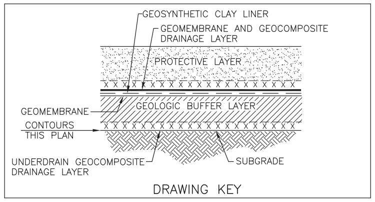


LEGEND

MONITORING WELLS
PROPOSED GAS PROBE
EXISTING CONTOURS
PROPOSED CONTOURS
CONSTRUCTION BASELINE
CELL VII LIMITS OF DISPOSAL
CELL V LIMITS OF DISPOSAL
6" GROUNDWATER EXTRACTION PIPE
PERIMETER CHANNEL
GROUNDWATER SIDERISER
SILT FENCE
PROPERTY BOUNDARY
FACILITY BOUNDARY

NOTES

1. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
2. AS-BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 23, 2005.
3. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM—SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
4. CONSTRUCTION OF PROPOSED CELL VII AND ANCILLARY FACILITIES IS LIMITED TO THE 68.13 ACRE AREA DEPICTED IN THIS DRAWING.
5. PROPOSED CELL VII AREA WILL BE USED AS A SOIL STOCKPILE AREA AND BORROW SOURCE PRIOR TO LANDFILLING.
6. PROPOSED CELL VII IS ANTICIPATED TO TIE INTO CELL V TO FORM ONE CONTIGUOUS LANDFILL CELL.
7. WHERE GROUND WATER EXISTS OR IS EXPECTED TO BE ENCOUNTERED DURING EXCAVATION, A DEWATERING SYSTEM WILL BE INSTALLED TO PREVENT SOFTENING AND DISTURBANCE OF SUBGRADE BELOW FOUNDATIONS AND FILL MATERIAL, TO ALLOW FOUNDATIONS, FILL MATERIAL, AND STRUCTURES/BACKFILL TO BE PLACED IN THE DRY, AND TO MAINTAIN A STABLE EXCAVATION. GROUND WATER SHALL BE MAINTAINED BELOW THE BOTTOM OF ANY EXCAVATION. THE DEWATERING SYSTEM WILL REMAIN IN OPERATION TO PREVENT POSSIBLE BUOYANT UPLIFT FORCE ON STRUCTURES OR FILL MATERIAL AND DISPOSAL OF GROUNDWATER WILL NOT INTERFERE WITH THE CONSTRUCTION OPERATIONS OR DAMAGE EXISTING CONSTRUCTION AS APPROVED BY THE OWNER. INSTALLATION OF GROUND WATER MONITORING POINTS MAY BE NECESSARY TO MAINTAIN THE DEWATERING SYSTEM TO PREVENT A QUICK UPSURGE OF WATER THAT MIGHT WEAKEN THE SUBGRADE.
8. THE GROUNDWATER COLLECTIONS SYSTEM IS SHOWN FOR CELL VII WHICH WILL BE CONSTRUCTED IN TWO PAHSES.
9. ALL COLLECTION AND HEADER GROUNDWATER PIPING INSIDE THE CELL WILL BE HDPE (SDR11) PIPE.
10. ENCLOSURE WILL BE REMOVED AND THE LEACHATE SIDERISER AND CLEANOUTS WILL BE EXTENDED. THE GROUNDWATER SIDERISER WILL BE CAPPED AND TERMINATED. GROUNDWATER IS NO LONGER PUMPED FROM CELL V AS IT HAS ADEQUATE BALLAST TO OFFSET THE HYDROSTATIC FORCES OF THE GROUNDWATER. EXTENSION OF THE LEACHATE SIDERISER AND CLEANOUTS IS SHOWN ON THE MODIFICATIONS PLAN WITH THE LEACHATE COLLECTION PIPING.



DRAWING KEY

HDR Engineering, Inc.
of the Carolinas
3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
C	04/2010	REVISED TO INCLUDE PROPOSED GAS PROBES, MONITORING WELLS, AND NOTE 10
B	02/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK
Lic. No. 043303

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK VIRGINIA

BASEGRADE PLAN

0 1" 2"

FILENAME	00C-02.dwg
SCALE	1"=100'
SHEET	C-02

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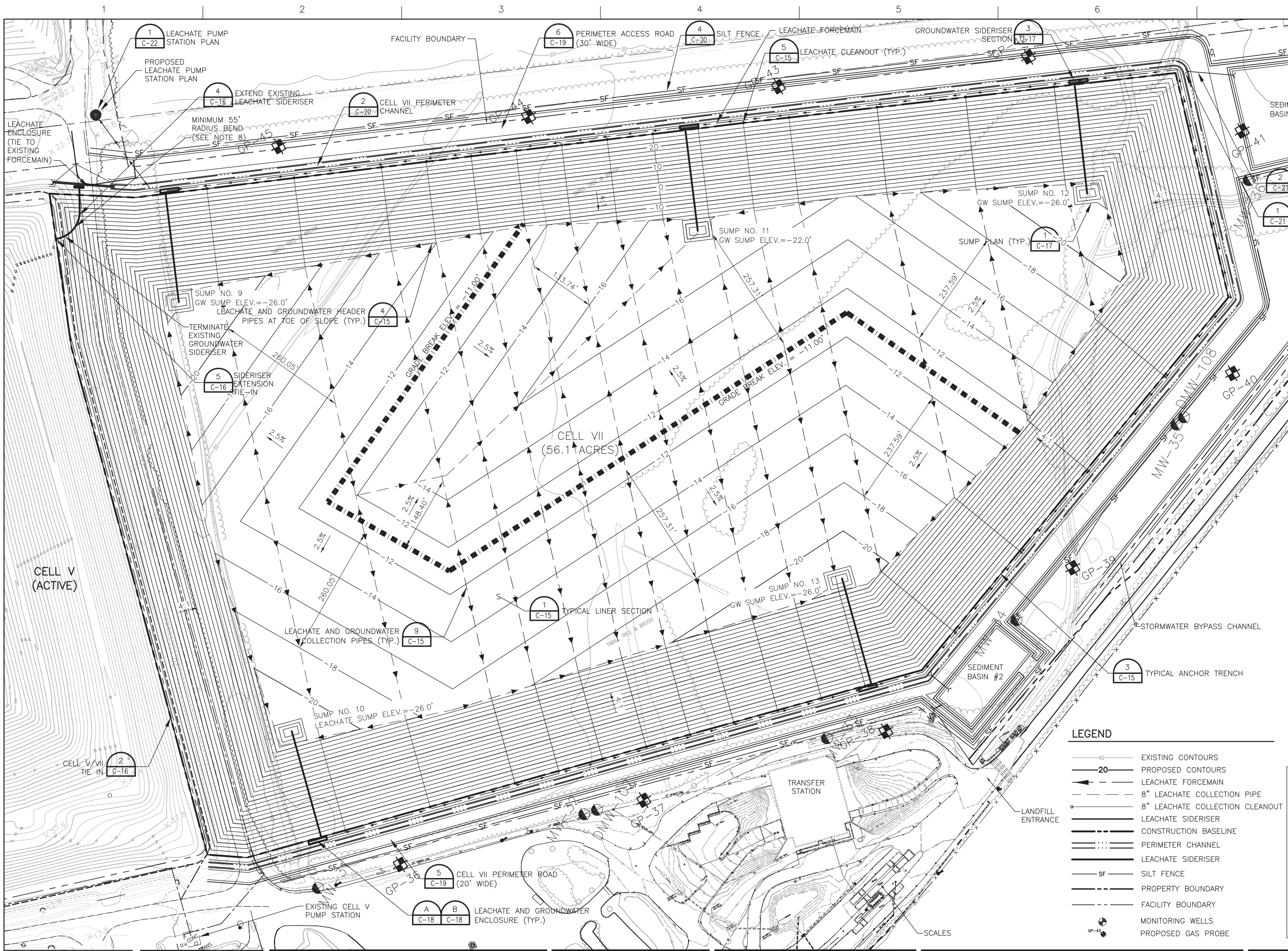
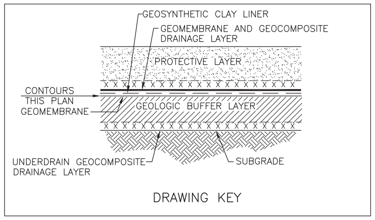


NOTES

1. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
2. AS-BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PROFFITT DATED SEPTEMBER 19, 2005.
3. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM—SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
4. CONSTRUCTION OF PROPOSED CELL VII AND ANCILLARY FACILITIES IS LIMITED TO THE 68.13 ACRE AREA DEPICTED IN THIS DRAWING.
5. LEACHATE COLLECTION PIPES ARE SPACED FOR POTENTIAL LEACHATE RECIRCULATION.
6. THE LEACHATE COLLECTION SYSTEM IS SHOWN FOR CELL VII, WHICH WILL BE CONSTRUCTED IN TWO PHASES.
7. ALL COLLECTION AND HEADER LEACHATE PIPING INSIDE THE CELL WILL BE HDPE (SDR 11) PIPE.
8. EXTENDED LEACHATE SIDERISER WILL HAVE A MINIMUM 1% GRADE AND BE INSTALLED OVER STRUCTURAL FILL.

GRADING DEVELOPMENT CONSISTS OF:

1. SUBGRADE PREPARATION AND TRENCHING FOR PLACEMENT OF THE GROUNDWATER COLLECTION SYSTEM.
2. PLACEMENT OF A GEONET WITH FILTER FABRIC BONDED TO EACH SIDE (GEOCOMPOSITE DRAIN) AS AN UNDERDRAIN.
3. PLACEMENT OF A ONE FOOT COMPACTED GEOLOGIC BUFFER LAYER ON THE GEOCOMPOSITE DRAIN
4. INSTALL 40 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GEOLOGIC BUFFER LAYER.
5. INSTALL A GEOSYNTHTETIC CLAY LINER.
6. INSTALL 60 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GCL.
7. PLACEMENT OF A GEOCOMPOSITE DRAIN WITH FILTER FABRIC BONDED TO EACH SIDE FOR THE LEACHATE COLLECTION SYSTEM.
8. PLACEMENT OF A 1.5 FOOT PERMEABLE PROTECTIVE COVER LAYER.
9. CONSTRUCTION OF PERFORATED HDPE LEACHATE PIPE COLLECTION SYSTEM.



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	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK
Lic. No. 043303

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK VIRGINIA

MODIFICATIONS PLAN

0 1" 2"

FILENAME	00C-03.dwg	SHEET
SCALE	1"=100'	C-03

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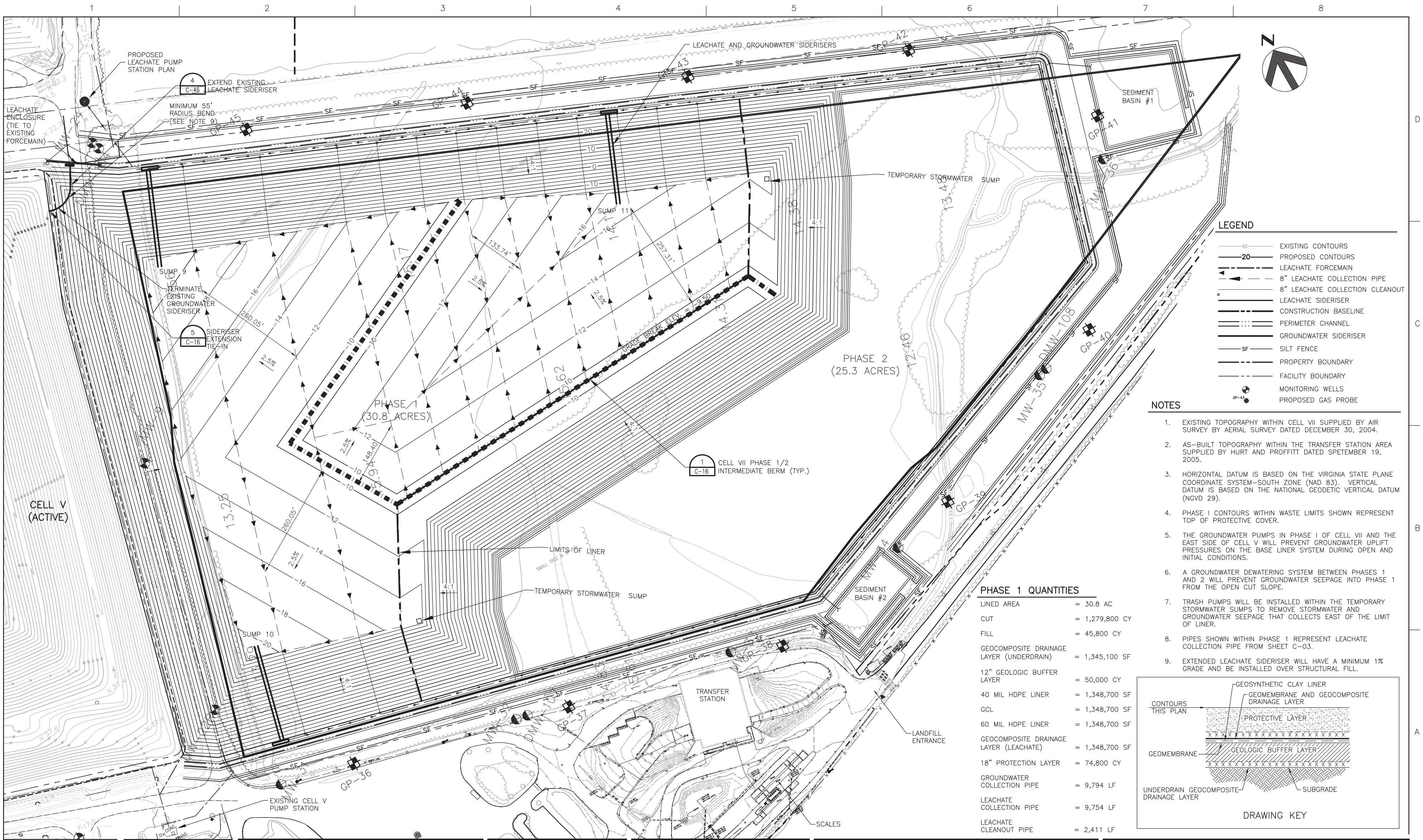

LEGEND

- EXISTING CONTOURS
- PROPOSED CONTOURS
- LEACHATE FORCEMAIN
- 8" LEACHATE COLLECTION PIPE
- 8" LEACHATE COLLECTION CLEANOUT
- LEACHATE SIDERISER
- CONSTRUCTION BASELINE
- PERIMETER CHANNEL
- GROUNDWATER SIDERISER
- SILT FENCE
- PROPERTY BOUNDARY
- FACILITY BOUNDARY
- MONITORING WELLS
- PROPOSED GAS PROBE

NOTES

1. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
2. AS-BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PROFFITT DATED SPETEMBER 19, 2005.
3. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
4. PHASE I CONTOURS WITHIN WASTE LIMITS SHOWN REPRESENT TOP OF PROTECTIVE COVER.
5. THE GROUNDWATER PUMPS IN PHASE I OF CELL VII AND THE EAST SIDE OF CELL V WILL PREVENT GROUNDWATER UPLIFT PRESSURES ON THE BASE LINER SYSTEM DURING OPEN AND INITIAL CONDITIONS.
6. A GROUNDWATER DEWATERING SYSTEM BETWEEN PHASES 1 AND 2 WILL PREVENT GROUNDWATER SEEPAGE INTO PHASE 1 FROM THE OPEN CUT SLOPE.
7. TRASH PUMPS WILL BE INSTALLED WITHIN THE TEMPORARY STORMWATER SUMPS TO REMOVE STORMWATER AND GROUNDWATER SEEPAGE THAT COLLECTS EAST OF THE LIMIT OF LINER.
8. PIPES SHOWN WITHIN PHASE 1 REPRESENT LEACHATE COLLECTION PIPE FROM SHEET C–03.
9. EXTENDED LEACHATE SIDERISER WILL HAVE A MINIMUM 1% GRADE AND BE INSTALLED OVER STRUCTURAL FILL.

PHASE 1 QUANTITIES

LINED AREA	= 30.8 AC
CUT	= 1,279,800 CY
FILL	= 45,800 CY
GEOCOMPOSITE DRAINAGE LAYER (UNDERDRAIN)	= 1,345,100 SF
12" GEOLOGIC BUFFER LAYER	= 50,000 CY
40 MIL HDPE LINER	= 1,348,700 SF
GCL	= 1,348,700 SF
60 MIL HDPE LINER	= 1,348,700 SF
GEOCOMPOSITE DRAINAGE LAYER (LEACHATE)	= 1,348,700 SF
18" PROTECTION LAYER	= 74,800 CY
GROUNDWATER COLLECTION PIPE	= 9,794 LF
LEACHATE COLLECTION PIPE	= 9,754 LF
LEACHATE CLEANOUT PIPE	= 2,411 LF

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PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK
Lic. No. 043303

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

PHASE 1 TOP OF PROTECTIVE COVER

0 1" 2"

FILENAME	00C–04.dwg
SCALE	1"=100'

SHEET
C-04

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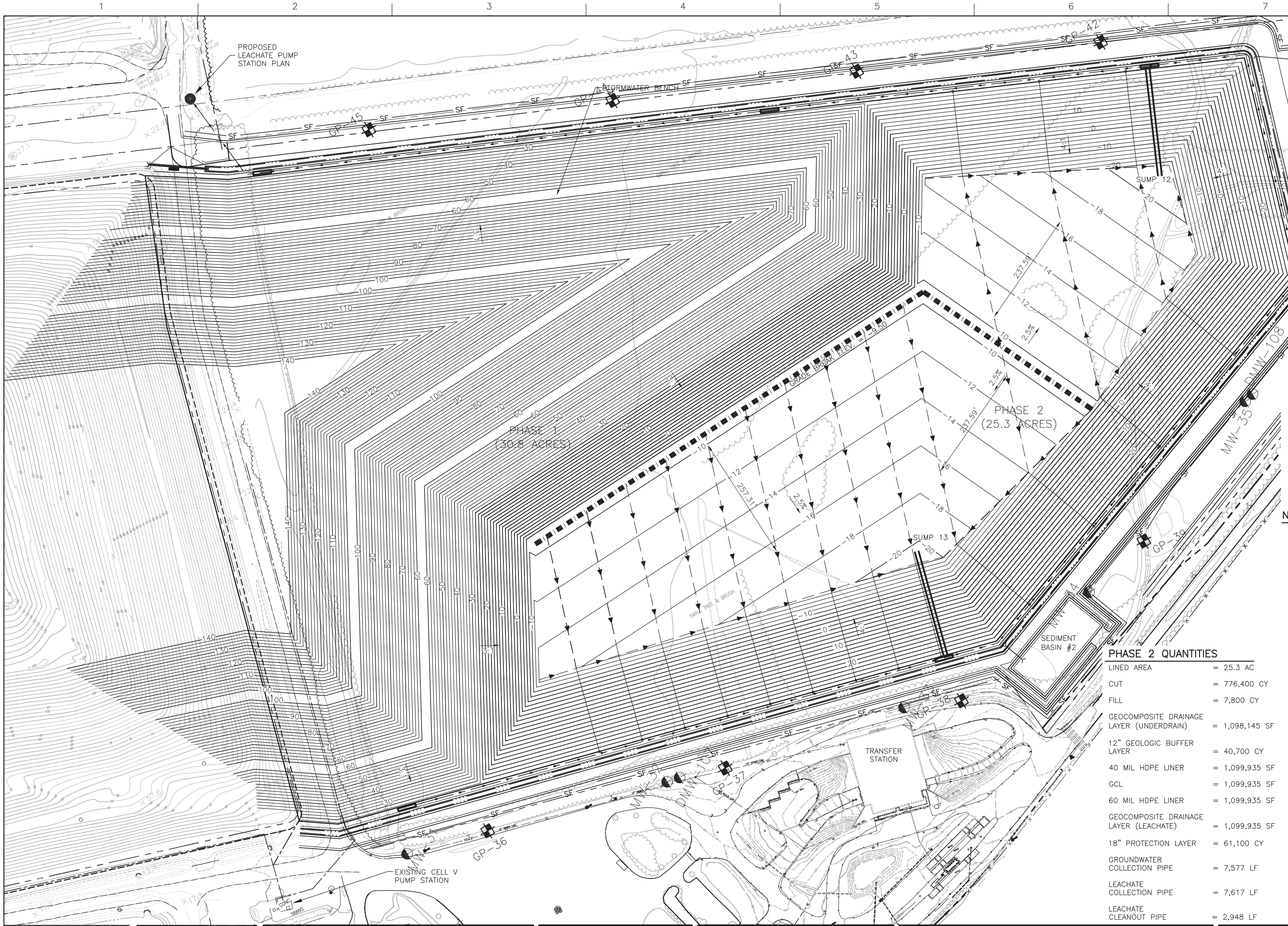


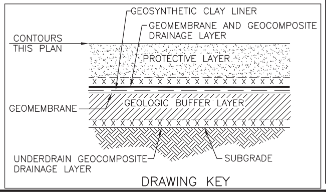
LEGEND

NOTES

1. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
2. AS-BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PRIFFITT DATED SPETEMBER 19, 2005.
3. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
4. PHASE 1 COUNTOURS WITHIN WASTE LIMITS SHOWN REPRESENT MAXIMUM WASTE ELEVATIONS PRIOR TO CONSTRUCTION OF PHASE 2.
5. PHASE 2 CONTOURS WITHIN WASTE LIMITS SHOWN REPRESENT TOP OF PROTECTIVE COVER.
6. THE GROUNDWATER PUMPS WITHIN PHASES 1 AND 2 OF CELL VII WILL PREVENT GROUNDWATER UPLIFT PRESSURES ON THE BASE LINER SYSTEM WITHIN PHASE 2 DURING OPEN AND INITIAL CONDITIONS.
7. THE GROUNDWATER PUMPS WITHIN CELL VII MAY BE TURNED OFF WHEN SUFFICIENT WASTE BALLAST EXISTS TO COUNTERACT GROUNDWATER UPLIFT PRESSURES ON THE BASE LINER SYSTEM.
8. PIPES SHOWN WITHIN PHASE 2 FOOTPRINT REPRESENT LEACHATE COLLECTION PIPES FROM SHEET C-03.

PHASE 2 QUANTITIES

LINED AREA	= 25.3 AC
CUT	= 776,400 CY
FILL	= 7,800 CY
GEOCOMPOSITE DRAINAGE LAYER (UNDERDRAIN)	= 1,098,145 SF
12" GEOLOGIC BUFFER LAYER	= 40,700 CY
40 MIL HDPE LINER	= 1,099,935 SF
GCL	= 1,099,935 SF
60 MIL HDPE LINER	= 1,099,935 SF
GEOCOMPOSITE DRAINAGE LAYER (LEACHATE)	= 1,099,935 SF
18" PROTECTION LAYER	= 61,100 CY
GROUNDWATER COLLECTION PIPE	= 7,577 LF
LEACHATE COLLECTION PIPE	= 7,617 LF
LEACHATE CLEANOUT PIPE	= 2,948 LF



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PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK
Lic. No. 043303
4/9/10

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK VIRGINIA

PHASE 2 TOP OF PROTECTIVE COVER

0 1" 2"

FILENAME	00C-05.dwg
SCALE	1"=100'

SHEET
C-05

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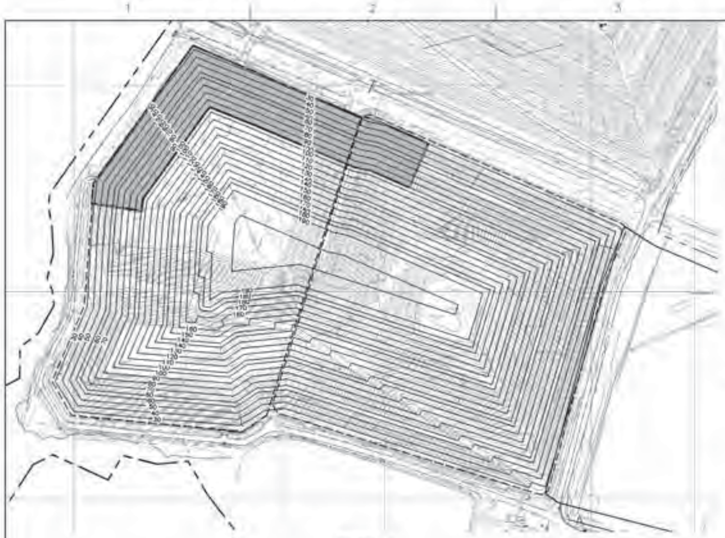

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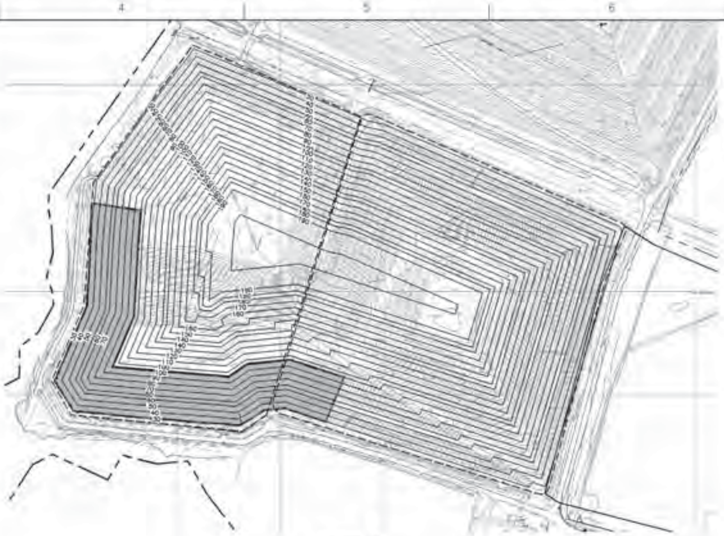

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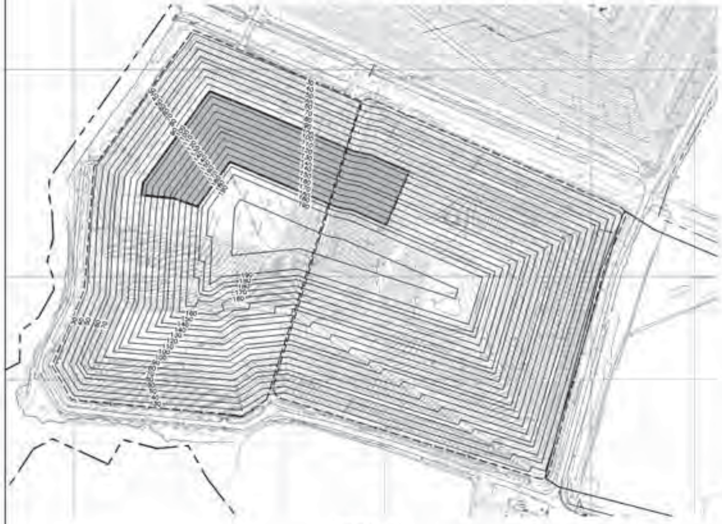
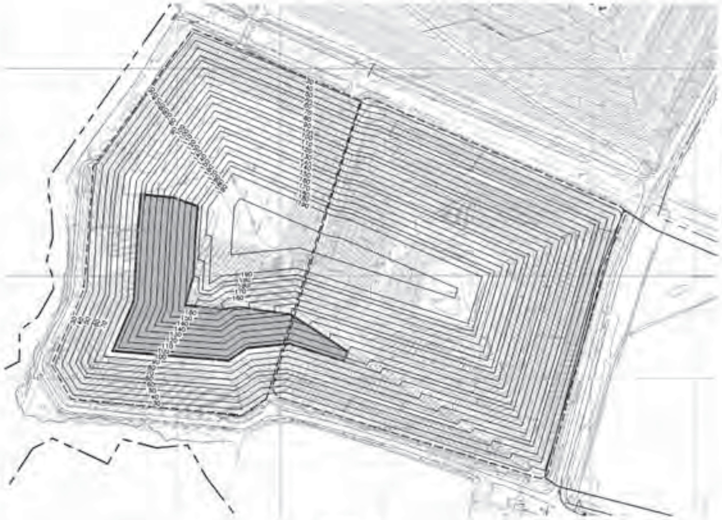


PHASE 3



PHASE 4

NOTES

1. PROPOSED CONTOURS SHOWN REPRESENT MAJOR CONTOURS (EVERY 10') FOR CLARIFICATION.
2. LIMITS OF CLOSURE PHASES MAY BE ADJUSTED FROM THOSE SHOWN BASED ON FIELD CONDITIONS AT THE TIME OF CLOSURE.

FINAL COVER SYSTEM

PHASE	AREA (AC)	12" INTERMEDIATE COVER (CY)	18" INFILTRATION LAYER (CY)	40 MIL LLDPE LINER (SF)	GEOCOMPOSITE DRAINAGE LAYER (SF)	18" PROTECTIVE COVER SOIL (CY)	6" TOPSOIL (CY)
1	10.4	16,790	25,185	453,325	453,325	25,185	8,395
2	11.4	18,330	27,496	494,923	494,923	27,496	9,165
3	8.7	14,096	21,144	380,585	380,585	21,144	7,048
4	8.0	12,946	19,419	349,546	349,546	19,419	6,473

NOTE: QUANTITIES ARE FOR INDIVIDUAL CLOSURE PHASES AS SHOWN IN HATCHED AREAS.

LEGEND

——4——	EXISTING CONTOURS
——20——	PROPOSED CONTOURS
—·—·—	PROPERTY BOUNDARY
▨	EXTENTS OF CLOSURE PHASE

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PROJECT MANAGER	D. DECESARE, P.E. T. YANOSCHAK, P.E. G. WILLIAMS, E.I. L. PATTERSON
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK Lic. No. 041383

2-11-09

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK **VIRGINIA**

CELLS V, VI, AND VII
CLOSURE SCHEDULE

0 1" 2"

FILENAME	00C-06.dwg
SCALE	1"=300'

SHEET **C-06**

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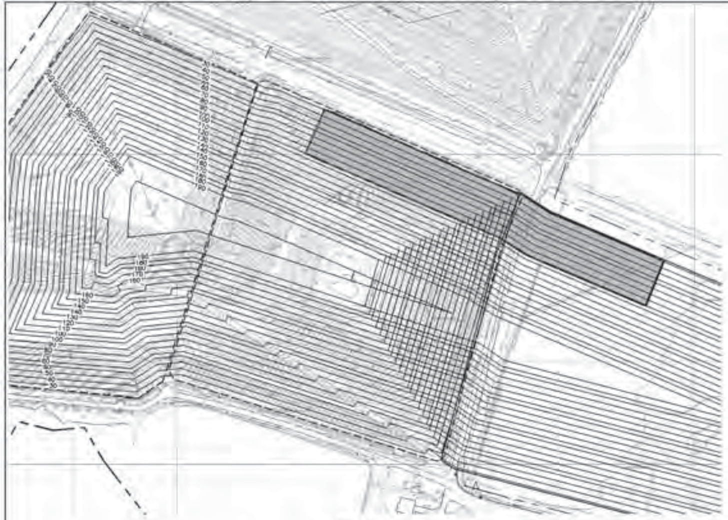

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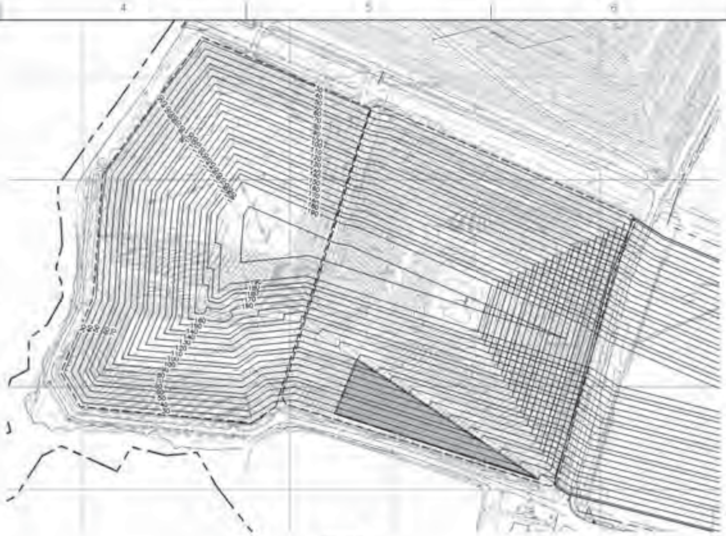
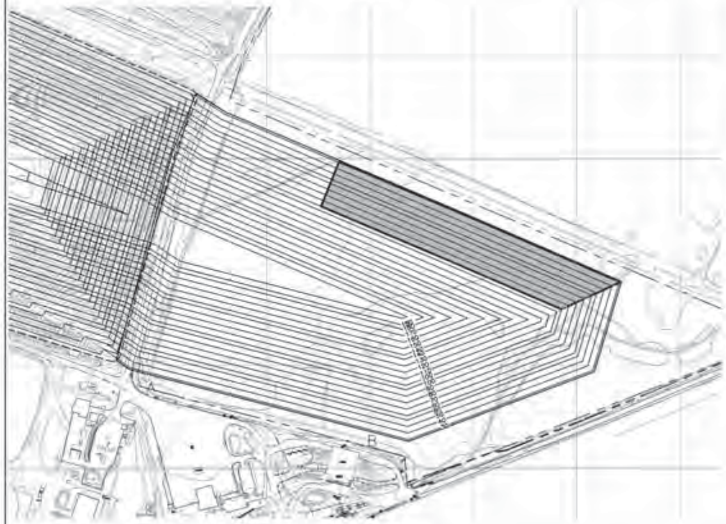
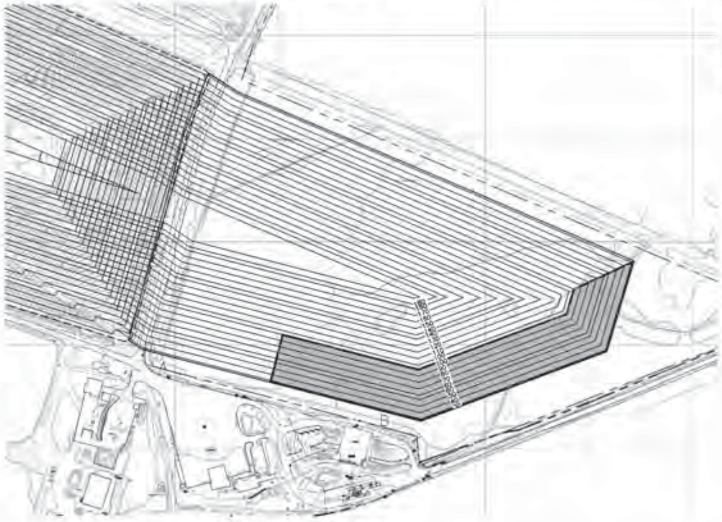


PHASE 6



PHASE 7



PHASE 8

NOTES

1. PROPOSED CONTOURS SHOWN REPRESENT MAJOR CONTOURS (EVERY 10') FOR CLARIFICATION.
2. LIMITS OF CLOSURE PHASES MAY BE ADJUSTED FROM THOSE SHOWN BASED ON FIELD CONDITIONS AT THE TIME OF CLOSURE.

FINAL COVER SYSTEM

PHASE	AREA (AC)	12" INTERMEDIATE COVER (CY)	18" INFILTRATION LAYER (CY)	40 MIL LLDPE LINER (SF)	GEOCOMPOSITE DRAINAGE LAYER (SF)	18" PROTECTIVE COVER SOIL (CY)	6" TOPSOIL (CY)
5	8.7	15,590	23,385	420,931	420,931	23,385	7,795
6	3.3	5,344	8,015	144,287	144,287	8,016	2,672
7	7.4	12,001	18,001	324,016	324,016	18,001	6,000
8	10.1	16,281	24,437	439,862	439,862	24,437	8,146

NOTE: QUANTITIES ARE FOR INDIVIDUAL CLOSURE PHASES AS SHOWN IN HATCHED AREAS

LEGEND

- EXISTING CONTOURS
20 PROPOSED CONTOURS
- PROPERTY BOUNDARY
▨ EXTENTS OF CLOSURE PHASE

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T.M. YANOSCHAK, P.E.
G. WILLIAMS, E.I.
L. PATTERSON
PROJECT NUMBER 00002889.018

SPSA
Regional Landfill
Cell VII Expansion
Part B Application
SUFFOLK VIRGINIA

CELLS V, VI, AND VII
CLOSURE SCHEDULE

0 1" 2"
FILENAME 00C-07.dwg
SCALE 1"=300'
SHEET C-07

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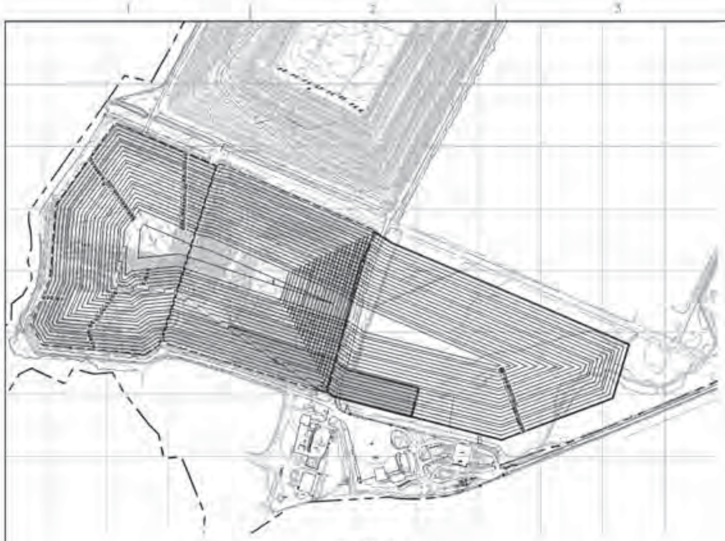
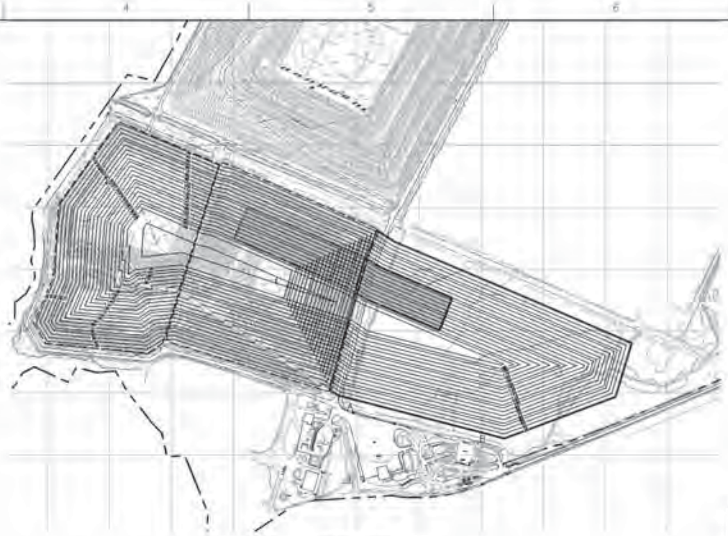
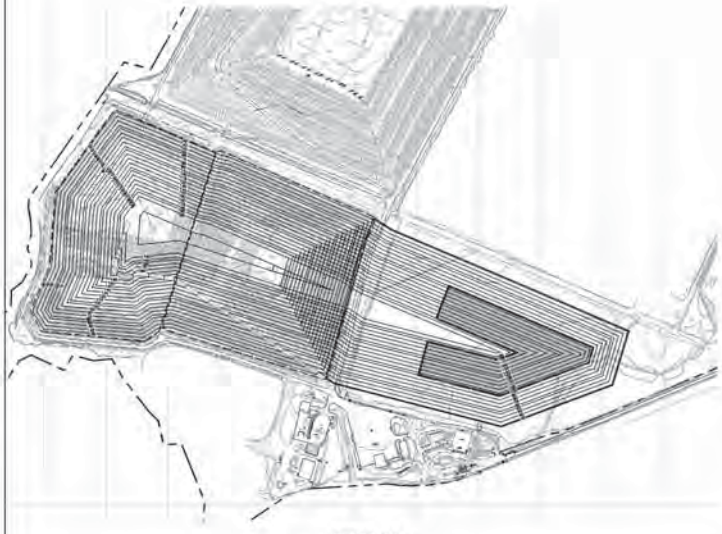


PHASE 9



PHASE 10



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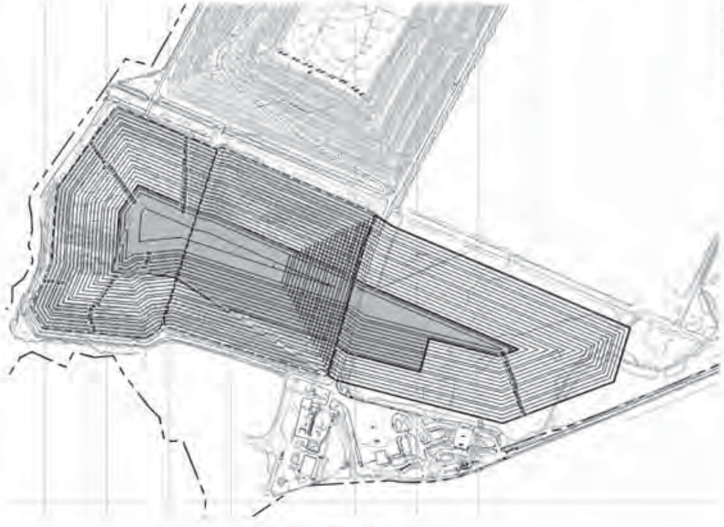

PHASE 12

N

NOTES

1. PROPOSED CONTOURS SHOWN REPRESENT MAJOR CONTOURS (EVERY 10') FOR CLARIFICATION.
2. LIMITS OF CLOSURE PHASES MAY BE ADJUSTED FROM THOSE SHOWN BASED ON FIELD CONDITIONS AT THE TIME OF CLOSURE.

FINAL COVER SYSTEM

PHASE	AREA (AC)	12" INTERMEDIATE COVER (CY)	18" INFILTRATION LAYER (CY)	40 MIL LLDPE LINER (SF)	GEOCOMPOSITE DRAINAGE LAYER (SF)	18" PROTECTIVE COVER SOIL (CY)	6" TOPSOIL (CY)
9	7.1	11,467	17,201	309,612	309,612	17,201	5,734
10	11.6	18,780	28,169	507,047	507,047	28,169	9,390
11	14.2	22,921	34,381	618,861	618,861	34,381	11,460
12	38.6	62,242	93,363	1,680,531	1,620,531	93,363	31,121

NOTE: QUANTITIES ARE FOR INDIVIDUAL CLOSURE PHASES AS SHOWN IN HATCHED AREAS.

LEGEND

— · —	EXISTING CONTOURS
—20—	PROPOSED CONTOURS
— · · —	PROPERTY BOUNDARY
▨	EXTENTS OF CLOSURE PHASE

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3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
B	02/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D. DECESARE, P.E.
	T. YANOSCHAK, P.E.
	G. WILLIAMS, E.I.
	L. PATTERSON
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

CELLS V, VI, AND VII CLOSURE SCHEDULE

0 1" 2"

FILENAME 00C-08.dwg

SCALE 1"=500'

SHEET C-08

C:\PWworking\TPA\dms93507\00C-08.dwg, Plot, 2/13/2009 10:30:39 AM, sfurell

NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I–IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED DECEMBER 27, 2007.
5. AS–BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL–SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
7. AS–BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PRITTITT DATED SEPTEMBER 19, 2005.
8. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
9. THE BUFFERS OUTLINED IN 9VAC 20–80–250 A(7) WILL BE MAINTAINED.
10. THE CONDITIONS SHOWN AS EXISTING ON THIS DRAWING REPRESENT GENERAL CONDITIONS AT THE TIME OF THE SURVEYS REFERENCED HEREIN.
11. FINAL COVER GRADES DEPICT TOP OF FINAL COVER.
12. STORMWATER BENCHES ARE SHOWN SCHEMATICALLY. (ARROWS SHOW DIRECTION OF FLOW)

LEGEND

———	EXISTING CONTOURS
——20——	FINAL COVER GRADES
——- - -——	CONSTRUCTION BASELINE
——- - -——	FACILITY BOUNDARY
———	SILT FENCE
► ► ►	SIDESLOPE BENCH
— — — —	DOWNCHUTE
——- - -——	PROPERTY BOUNDARY
═══:::═══	PERIMETER CHANNEL
———	DIVERSION BERM

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PROJECT MANAGER	D.T. DECESARE, P.E. T.M. YANOSCHAK, P.E. G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

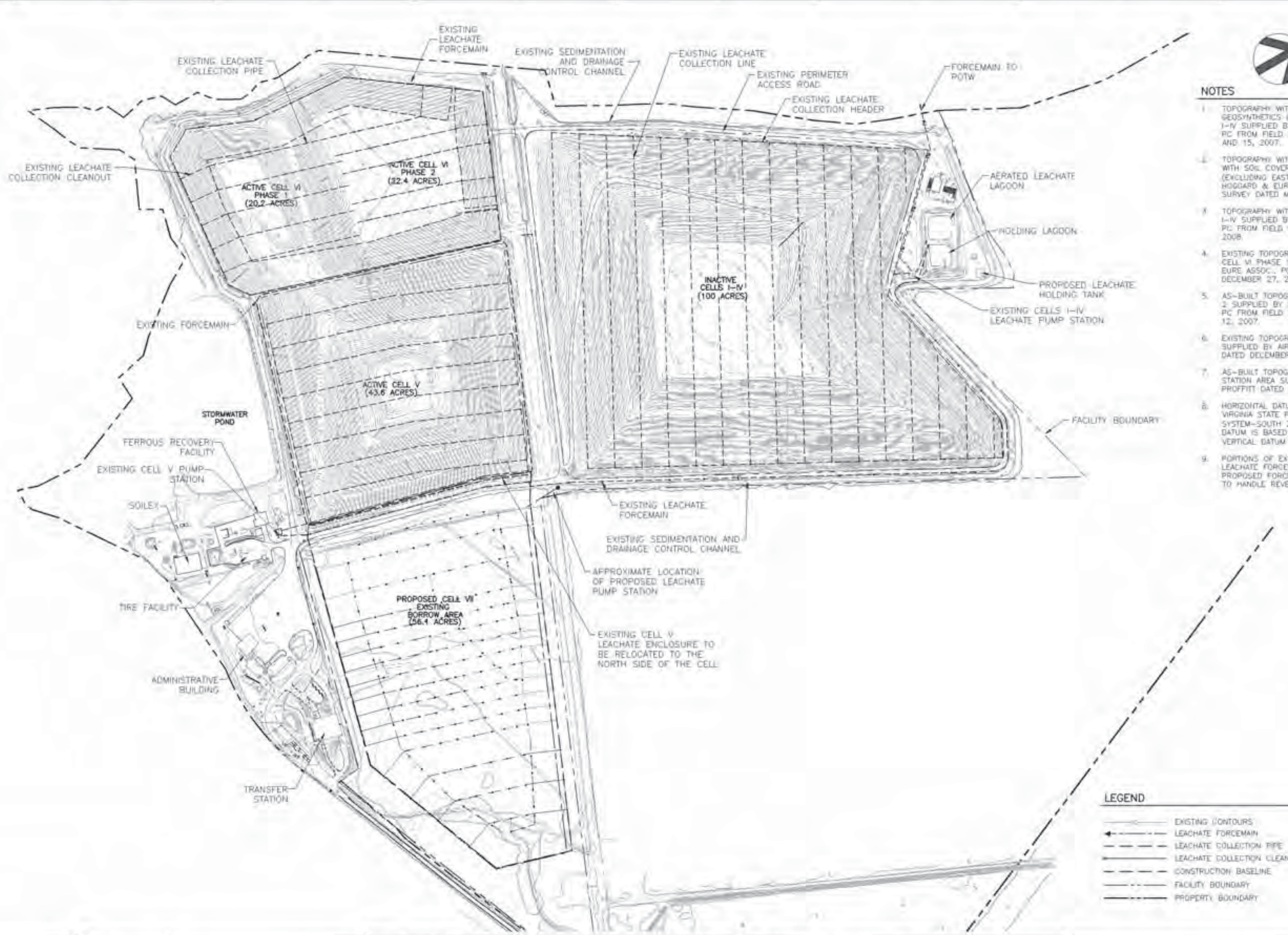
FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C-09.dwg
SCALE	1"=200'

SHEET C-09

C:\PWworking\TPA\dms93507\00C-09.DWG, Plot, 2/13/2009 10:32:09 AM, sfutrell



NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I–IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED DECEMBER 27, 2007.
5. AS–BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL–SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
7. AS–BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY HURT AND PROFFITT DATED SEPTEMBER 19, 2005.
8. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
9. PORTIONS OF EXISTING CELL V AND CELL VII LEACHATE FORCEMAINS MAY BE USED FOR PROPOSED FORCEMAIN IF ADEQUATELY SIZED TO HANDLE REVERSED FLOW DIRECTION.

LEGEND

——<——	EXISTING CONTOURS
◄- - —— - —	LEACHATE FORCEMAIN
— — — —	LEACHATE COLLECTION PIPE
•———	LEACHATE COLLECTION CLEANOUT
— — — —	CONSTRUCTION BASELINE
—— - - ——	FACILITY BOUNDARY
—— - - - ——	PROPERTY BOUNDARY

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PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

LEACHATE COLLECTION SYSTEM

0 1" 2"

FILENAME	00C-10.dwg
SCALE	1"=300'

SHEET C-10

NOTES

1. TOPOGRAPHY WITHIN CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 22, 2009. CLOSURE CONSTRUCTION COMPLETED MAY 29, 2009.
2. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED DECEMBER 27, 2007.
3. AS–BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL–SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
4. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
5. AS–BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SURVEY SUPPLIED BY HURT AND PROFFITT DATED SEPTEMBER 19, 2005.
6. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
7. DETAILS REGARDING PARAMETERS AND FREQUENCY OF MONITORING CAN BE FOUND IN THE GROUNDWATER MONITORING AND SAMPLING ANALYSIS PLAN.
8. NEW HEADER LINES TO TIE INTO EXISTING HEADER.
9. WELL LOCATIONS ARE APPROXIMATE. TOTAL NUMBER OF WELLS AND THEIR LOCATION MAY VARY AT TIME OF CONSTRUCTION.

LEGEND

40	EXISTING CONTOURS
20	PROPOSED CONTOURS
— —	PROPERTY BOUNDARY
	EXISTING DITCH
SF SF	SILT FENCE
	MONITORING WELLS
◐	EXISTING GAS PROBES
	CONSTRUCTION BASELINE (LIMITS OF GEOMEMBRANE)
— —	LIMITS OF CONSTRUCTION
▶ ▶	SIDESLOPE BENCH
	DOWNCHUTE
	PERIMETER CHANNEL
EW-187	PROPOSED GAS WELL
GP-43	PROPOSED GAS PROBE

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ISSUE	DATE	DESCRIPTION
D	01/2011	REVISED TO INCLUDE MW–10B
C	07/2009	CELLS I–IV AS–BUILT CLOSURE TOPOGRAPHY
B	02/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E
	T.M. YANOSCHAK, P.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

1-19-11

THOMAS M. YANOSCHAK
Lic. No. 0433[illegible]
1-19-11

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

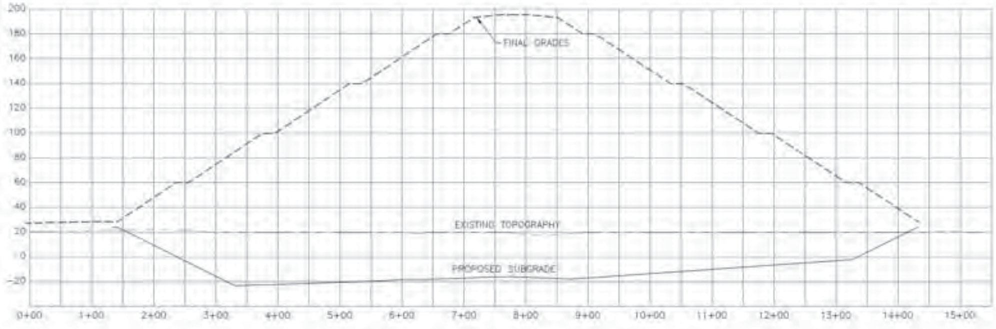
SUFFOLK VIRGINIA

FINAL SITE TOPOGRAPHY WITH MONITORING

0 1" 2"

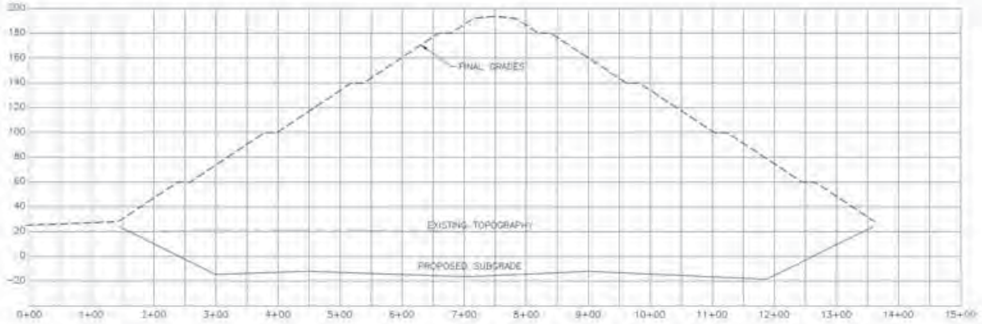
FILENAME	00C–11.dwg	SHEET
SCALE	1"=300'	C-11

C:\pwworking\tpa\dms93507\00C-11.DWG, Plot, 1/19/2011 3:25:03 PM, lpatters



SECTION A
H: 1"=100' V: 1"=50'

A
C-09



SECTION B
H: 1"=100' V: 1"=50'

B
C-09

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	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK

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Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

CROSS SECTIONS (SHEET 1 OF 3)

0" 1" 2"

FILENAME	00C-12.dwg
SCALE	AS SHOWN

SHEET C-12

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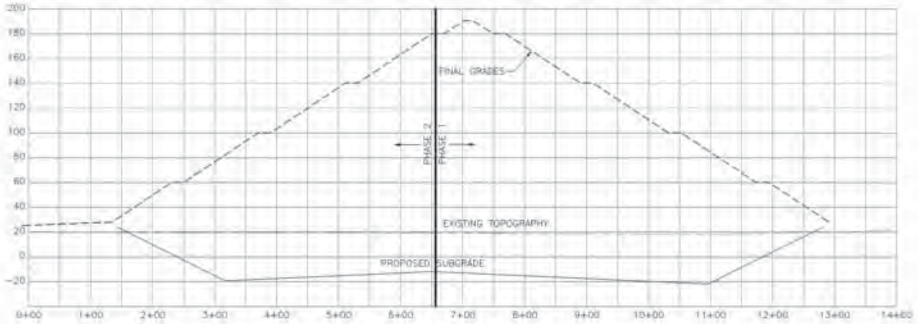
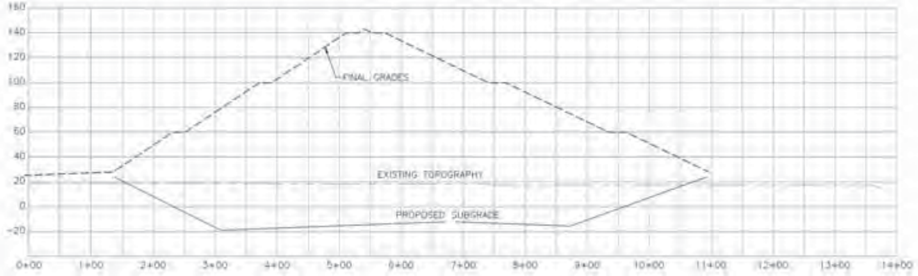


SECTION C
H: 1"=100' V: 1"=50'

C
C-08



SECTION D
H: 1"=100' V: 1"=50'

D
C-08

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PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK VIRGINIA

CROSS SECTIONS
(SHEET 2 OF 3)

0 1" 2"

FILENAME 00C-13.dwg
SCALE AS SHOWN

SHEET
C-13

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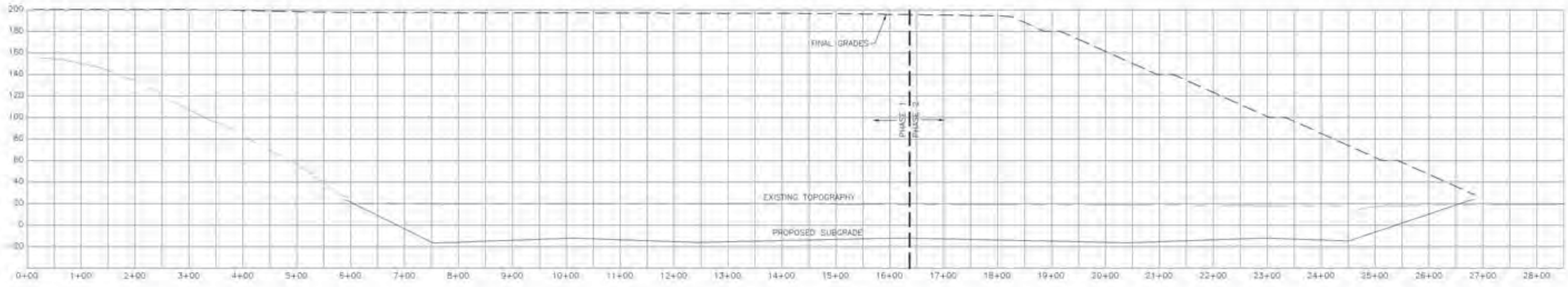

SECTION E

H: 1"=100' V: 1"=50'

E
C-09

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PROJECT NUMBER	00002889.018

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK **VIRGINIA**

CROSS SECTIONS
(SHEET 3 OF 3)

0 1" 2"

FILENAME 00C-14.dwg
SCALE AS SHOWN

SHEET
C-14

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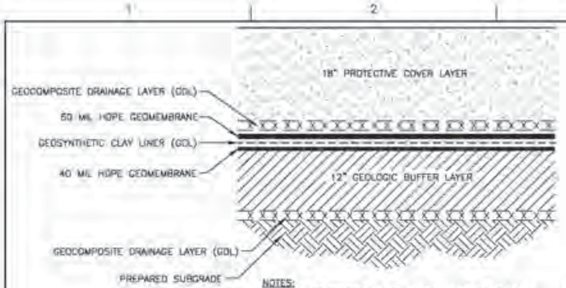
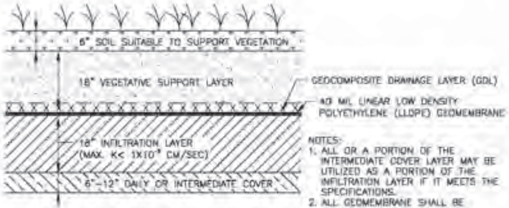


NOTES:
1. ALL GEOMEMBRANE TO BE TEXTURED ON BOTH SIDES.
2. THE REQUIRED THICKNESS IS MEASURED PERPENDICULAR TO THE SURFACE.

TYPICAL LINER SECTION

NTS

1 / C-03

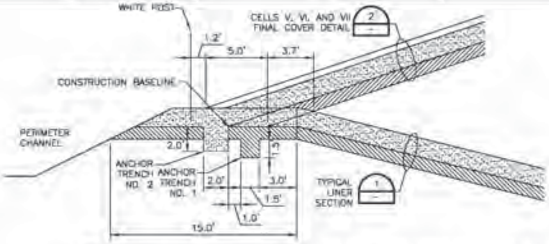


NOTES:
1. ALL OR A PORTION OF THE INTERMEDIATE COVER LAYER MAY BE UTILIZED AS A PORTION OF THE INFILTRATION LAYER IF IT MEETS THE SPECIFICATIONS.
2. ALL GEOMEMBRANE SHALL BE TEXTURED ON BOTH SIDES.

CELL V, VI & VII FINAL COVER DETAIL

NTS

2 / C-06

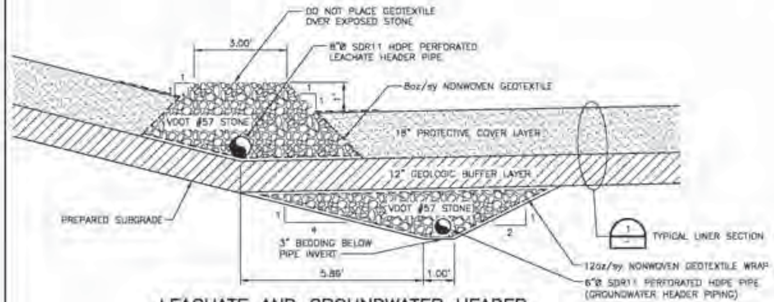


NOTES:
1. ONLY GROUNDWATER GDL SHALL BE TERMINATED WITHIN ANCHOR TRENCH NO. 1 ALL OTHER GEOSYNTHETIC LINER COMPONENTS SHALL BE TERMINATED WITHIN ANCHOR TRENCH NO. 2.
2. PLACE LOCATOR TAPE AND 14 GUAGE COPPER TRACER WIRE AT CREST OF BOTH ANCHOR TRENCHES.

TYPICAL ANCHOR TRENCH

1"=5'

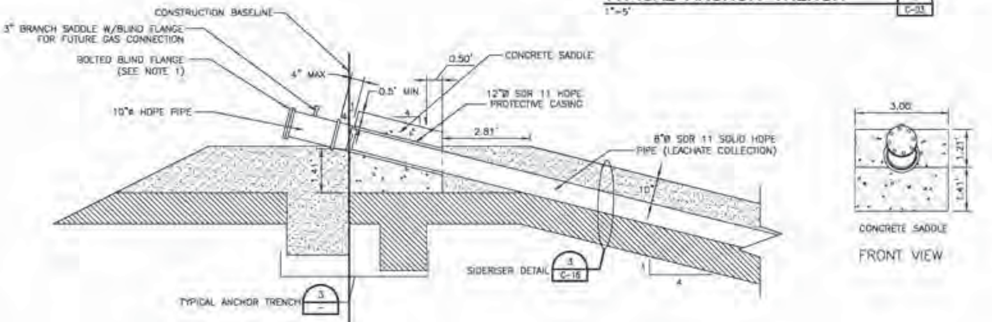
3 / C-03



LEACHATE AND GROUNDWATER HEADER PIPES AT TOE OF SIDE SLOPE

1"=2'

4 / C-02

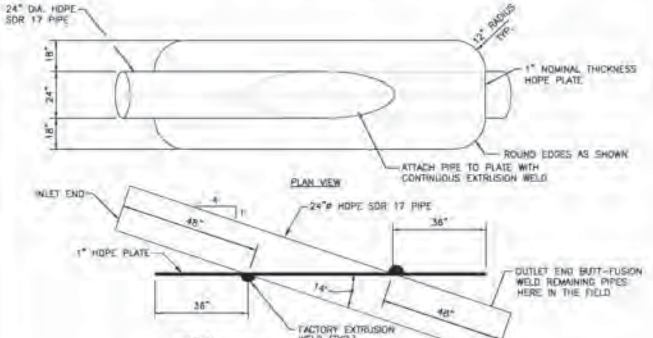


NOTES:
1) ALL LEACHATE CLEANOUT HARDWARE TO BE STAINLESS STEEL.

TYPICAL LEACHATE CLEANOUT

1"=2'

5 / C-03

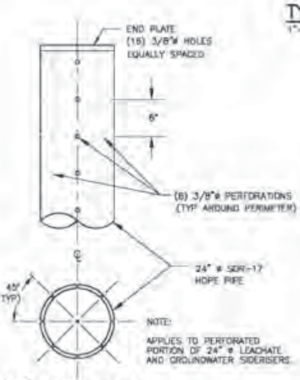


NOTES:
1. PENETRATION DETAIL APPLIES TO GROUNDWATER SIDERISER AT TOP OF BERM NEAR ANCHOR TRENCH. LINER (60 MIL AND 40 MIL HDPE) TO BE WELDED TO HDPE PLATE.

PREFABRICATED PIPE PENETRATION DETAIL

NTS

6 / C-17

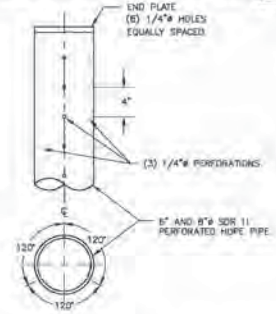


NOTE:
APPLIES TO PERFORATED PORTION OF 24" Ø LEACHATE AND GROUNDWATER SIDERISERS.

24" SUMP PIPE PERFORATION DETAIL

NTS

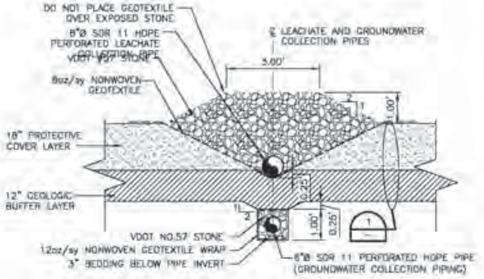
7



LEACHATE/GROUNDWATER COLLECTION PIPE DETAIL

NTS

8



LEACHATE AND GROUNDWATER COLLECTION PIPES

1"=2'

9 / C-02

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	T.M. YANOSHACK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

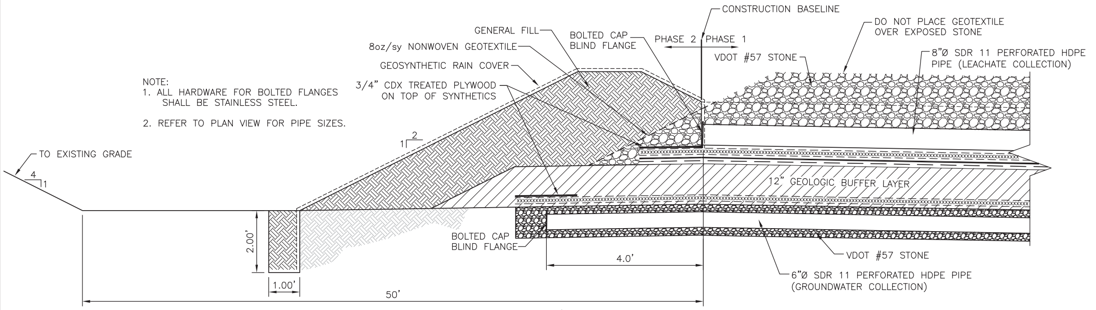
SUFFOLK **VIRGINIA**

LINER DETAILS
(SHEET 1 OF 2)

0 1" 2"

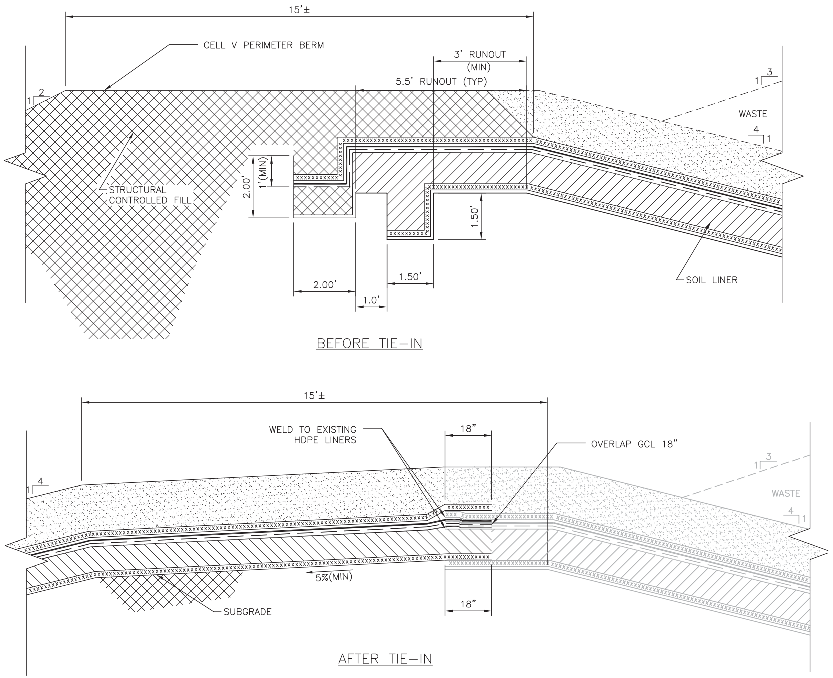
FILENAME	00C-15.dwg
SCALE	AS SHOWN

SHEET
C-15

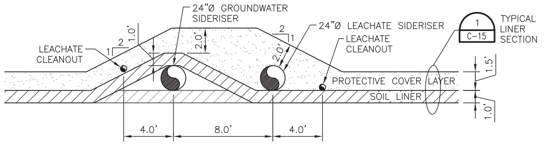


NOTE:
1. ALL HARDWARE FOR BOLTED FLANGES SHALL BE STAINLESS STEEL.
2. REFER TO PLAN VIEW FOR PIPE SIZES.

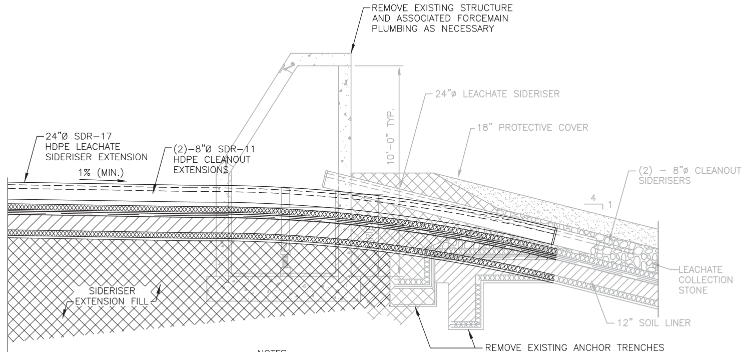
CELL VII PHASE 1/2 INTERMEDIATE BERM 1 C-04
NTS



CELL V/VII TIE-IN 2 C-03
NTS

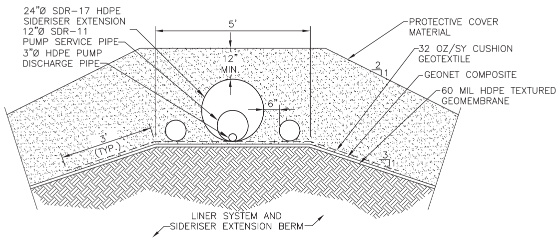


SIDERISER DETAIL 3 C-15
NTS

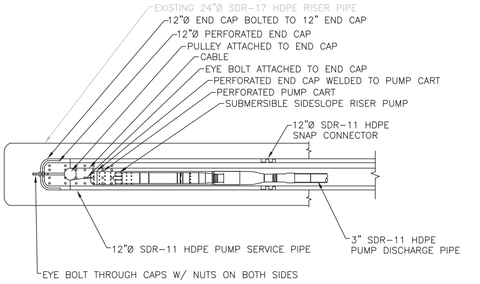


NOTES:
1. REMOVE ADEQUATE AMOUNT OF WASTE, COVER SOIL, AND LINER SYSTEM AS NECESSARY FOR PIPE WELDING AND TO LAY PIPE EXTENSIONS AT AN ACCEPTABLE RADIUS OF CURVATURE FOR PUMP INSTALLATION.
2. INTERIOR WELDING LIPS SHALL BE GROUND SMOOTH.
3. EXISTING SIDERISER, CLEANOUTS, AND PIPE EXTENSIONS SHALL BE EXAMINED WITH A REMOTE CAMERA AND CLEANED.

SIDERISER EXTENSION TIE-IN 4 -
NTS



SIDERISER EXTENSION SECTION 5 -
NTS



SIDERISER EXTENSION PUMP DETAIL 6 -
NTS

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ISSUE	DATE	DESCRIPTION
B	4/2010	REVISED TO INCLUDE SIDERISER EXTENSION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK
Lic. No. 043303

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK VIRGINIA

LINER DETAILS
(SHEET 2 OF 2)

0 1" 2"

FILENAME	00C-16.dwg
SCALE	AS SHOWN

SHEET
C-16

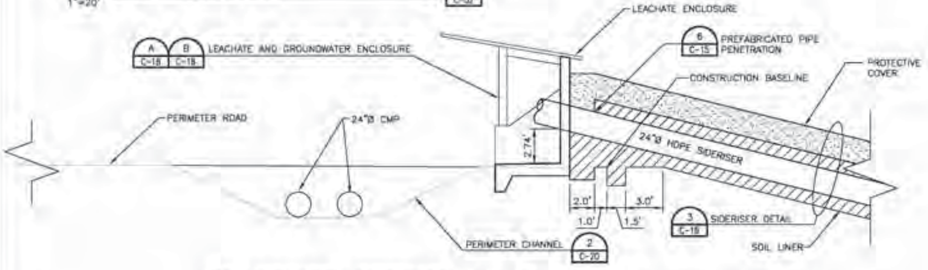
C:\pwworking\tpa\dms93507\00C-16.dwg, Plot, 4/9/2010 4:34:54 PM, lpatters

NOTES:
1. CONTOURS INCIDATE TOP OF SUBGRADE.
2. DETAIL DEPICTS SUMP NO. 9. OTHER CELL VI SUMPS WILL BE CONSTRUCTED SIMILARLY.

SUMP PLAN (TYPICAL)

1"=20'

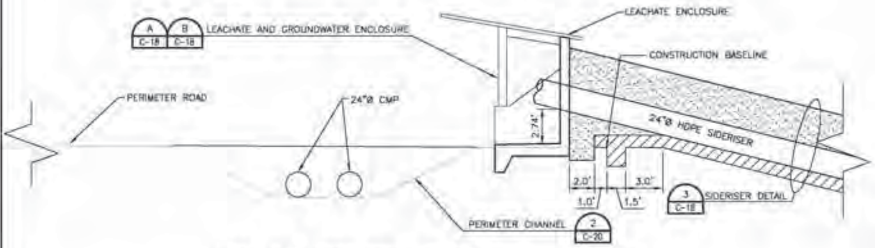
1 / C-20



GROUNDWATER SIDERISER SECTION

NTS

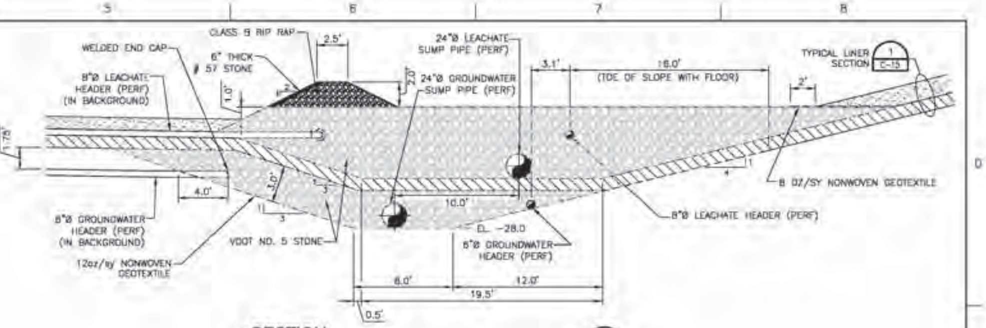
2 / –



LEACHATE SIDERISER SECTION

NTS

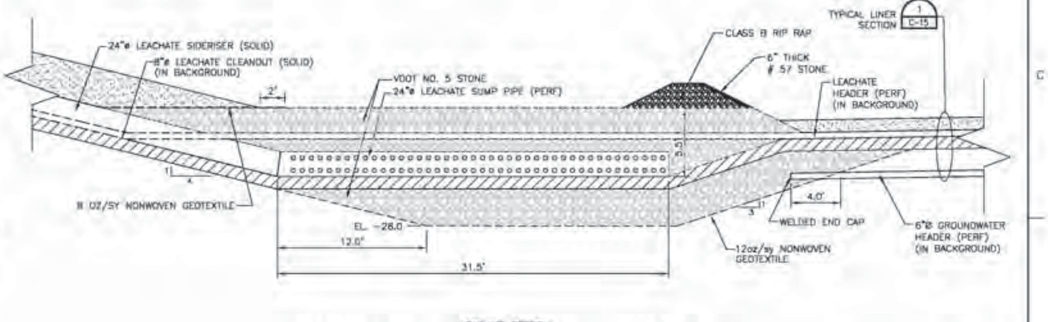
3 / –



SECTION

NTS

A / –

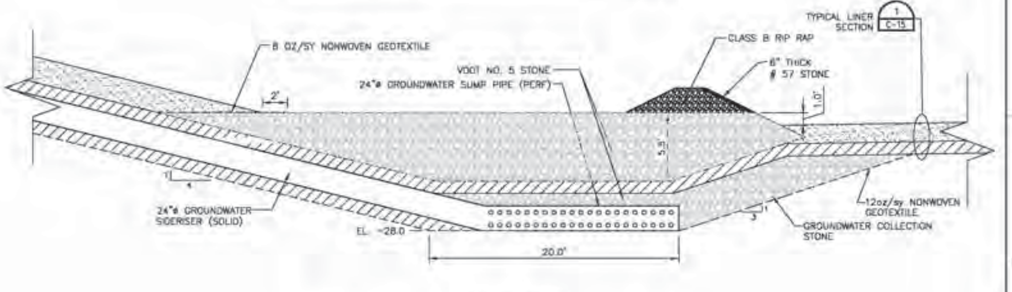


LEACHATE SECTION

SECTION

NTS

B / –



GROUNDWATER SECTION

SECTION

NTS

C / –

HDR

HDR Engineering, Inc. of the Carolinas

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER D.T. DECESARE, P.E.
T.M. YANOSCHAK, P.E.
G.M. WILLIAMS, E.I.
PROJECT NUMBER 00002889.018

THOMAS M. YANOSCHAK
Lic. No.
Lic. No. 36930
8-27-08

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK
VIRGINIA

LEACHATE MANAGEMENT DETAILS

0 1" 2"

FILENAME 00C-17.dwg
SCALE AS SHOWN

SHEET C-17

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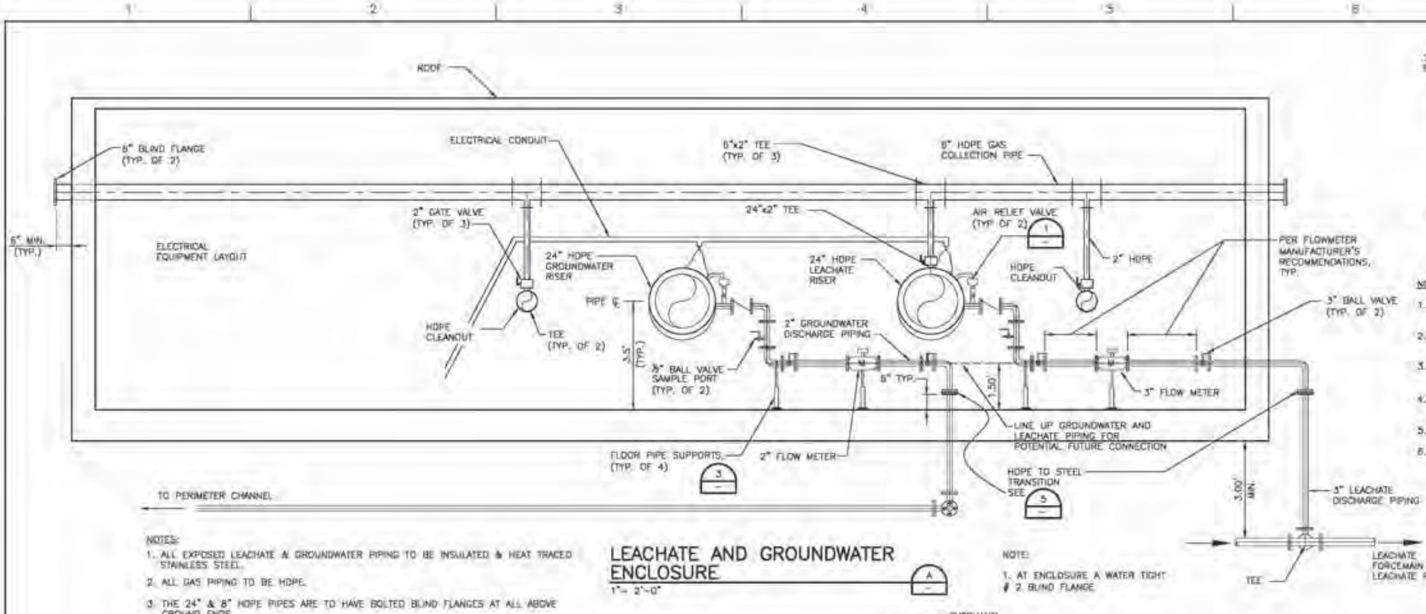


LEACHATE AND GROUNDWATER ENCLOSURE (A)

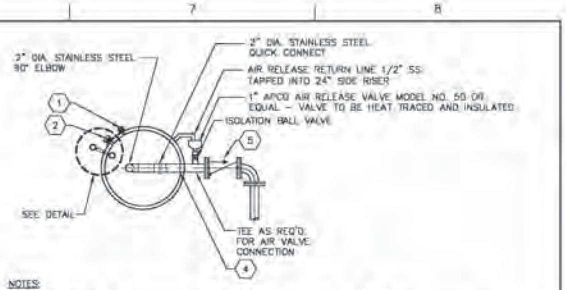
1"= 2'-0"

NOTES:

1. ALL EXPOSED LEACHATE & GROUNDWATER PIPING TO BE INSULATED & HEAT TRACED STAINLESS STEEL.
2. ALL GAS PIPING TO BE HDPE.
3. THE 24" & 8" HDPE PIPES ARE TO HAVE BOLTED BLIND FLANGES AT ALL ABOVE GROUND ENDS.

NOTE:

1. AT ENCLOSURE A WATER TIGHT # 2 BLIND FLANGE.



NOTES:

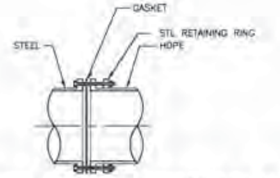
1. PENETRATIONS MAY BE ROTATED AS REQUIRED BY INSTALLATION. ALL PENETRATIONS TO BE IN UPPER HALF OF RISER PIPE.
2. ALLOW FOR REMOVAL OF CABLES FOR PUMP OR LEVEL SENSOR SERVICE AS REQUIRED.
3. DISCHARGE AND CABLE EXIT FITTINGS SHALL PROVIDE GAS TIGHT SEAL AND ALLOW FOR REMOVAL OF EQUIPMENT IF REQUIRED.
4. EXIT NIPPLE EACH END IS 2" M-NPT WITH STRAIGHT THREAD SECTION FOR ADJUSTMENT (NIPPLE SELF-TAPPING).
5. ALL VALVES TO BE FLANGED.
6. CABLE EXIT HOLES TO BE TAPPED USING STAINLESS STEEL M-NPT PIPE NIPPLE.

KEY NOTES:

①	1/2" SENSOR CABLE
②	3/4" POWER CABLE
③	3/8" # SS THREADED COUPLING
④	2" DISCHARGE EXIT NIPPLE
⑤	2" CHECK VALVE SWING TYPE SS
⑥	3/8" x 3" DIA. x 3" LONG SS SAFETY EYE BOLT W/SS NUT AND SS WASHER, TYP.

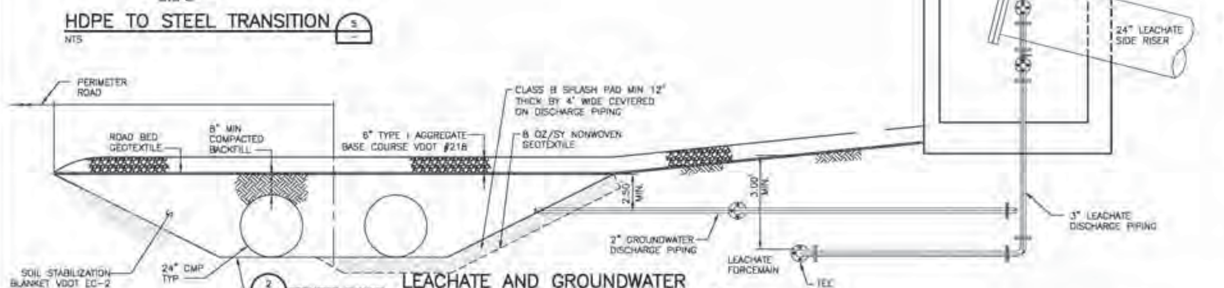
AIR RELIEF AND CONNECTION DETAIL (1)

1"= 2'-0"



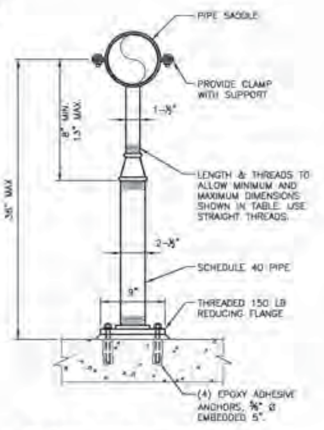
HDPE TO STEEL TRANSITION (5)

NTS



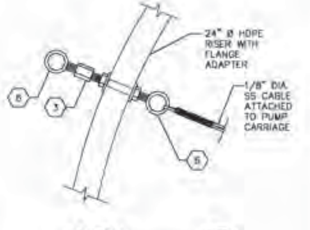
LEACHATE AND GROUNDWATER ENCLOSURE (B)

1"= 2'-0"



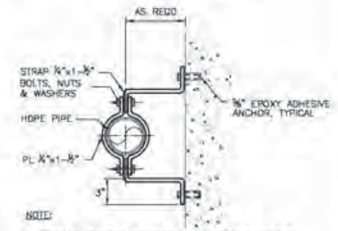
FLOOR PIPE SUPPORT (3)

NTS



DETAIL (2)

NTS



NOTE:

1. SPACING BETWEEN SUPPORTS SHALL NOT EXCEED 8 FEET.

WALL PIPE SUPPORT (4)

NTS

HDR
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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

LEACHATE ENCLOSURE DETAILS

FILENAME	00C-18.dwg	SHEET	C-18
SCALE	AS SHOWN		

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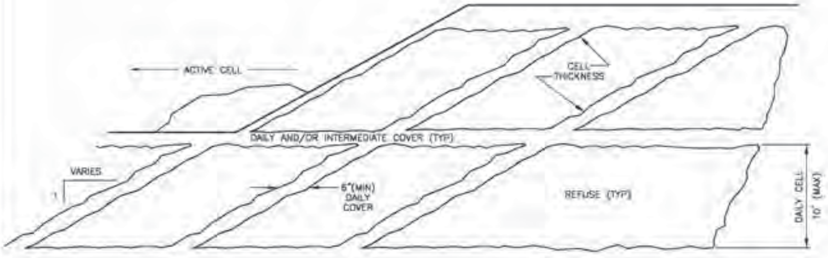
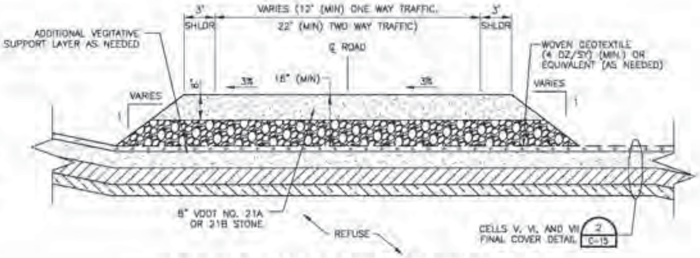
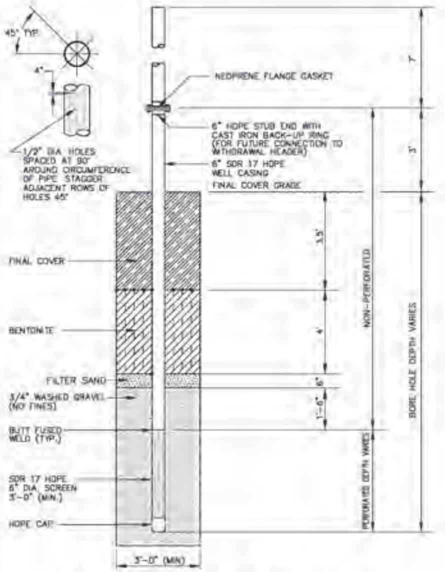


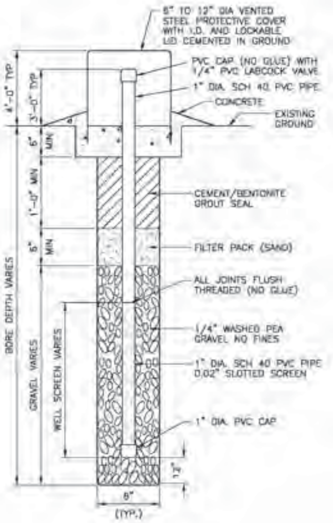
TYPICAL FILL PROGRESSION 1
NTS



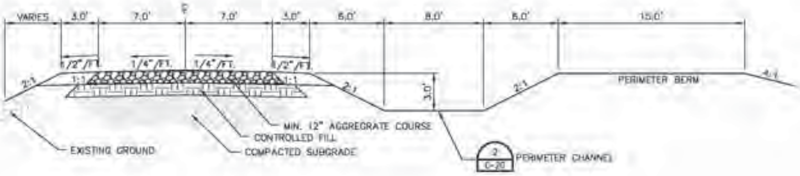
FINAL COVER MAINTENANCE ROAD 2 C-08
NTS



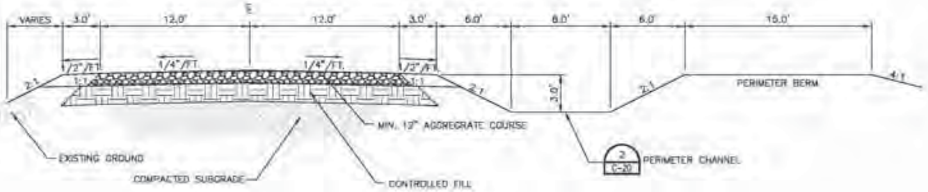
GAS RECOVERY WELL DETAIL 3
NTS



GAS PROBE DETAIL 4
NTS



CELL VII PERIMETER ROAD (20' WIDE) 5 C-02
1"=5'



CELL VII PERIMETER ROAD (30' WIDE) 6 C-02
1"=5'

HDR
HDR Engineering, Inc. of the Carolinas
3733 National Drive, Suite 207 | Raleigh, NC 27612

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	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

THOMAS M. YANOSCHAK
8-21-08

SPSA
Regional Landfill
Cell VII Expansion
Part B Application
SUFFOLK
VIRGINIA

CELL VII SECTION AND DETAILS

0 1" 2"

FILENAME	00C-19.dwg
SCALE	AS NOTED
SHEET	C-19

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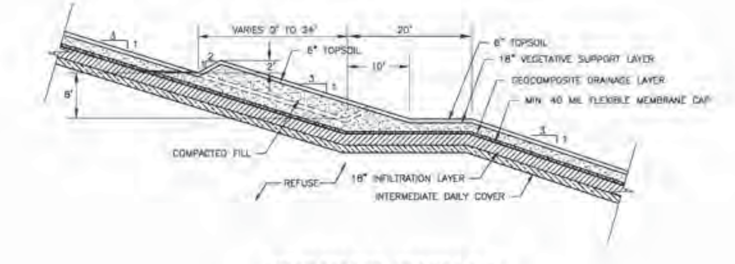
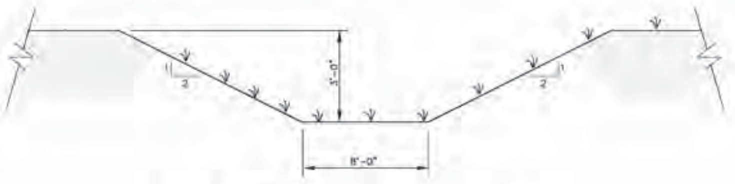
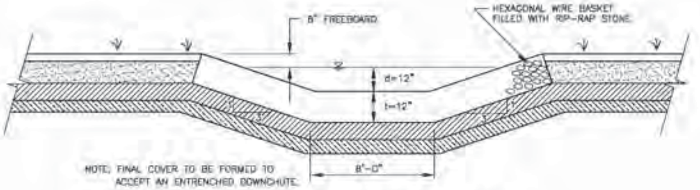


STORMWATER BENCH 1/C-09
NTS



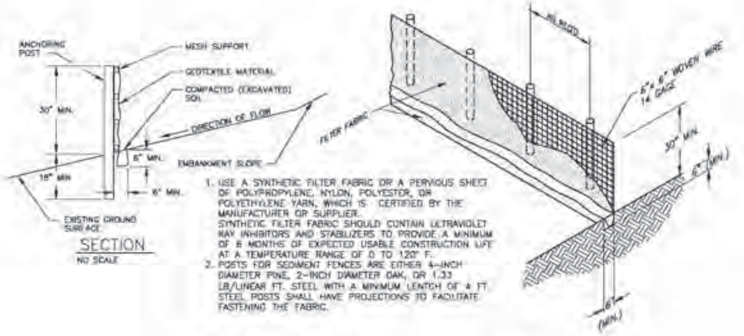
CELL VII PERIMETER CHANNEL 2/C-02
NTS

1) TEMPORARY LINING USE CURLEX I, PERMANENT LINING USE GRASS



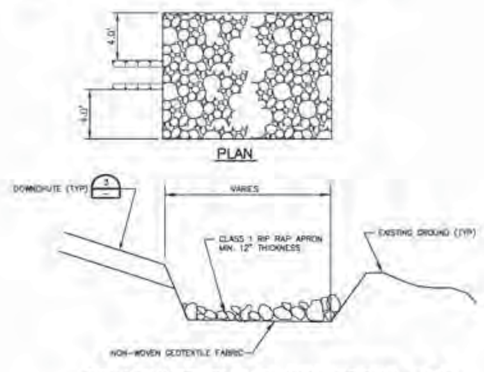
NOTE: FINAL COVER TO BE FORMED TO ACCEPT AN ENTRENCHED DOWNCHUTE.

DOWNCHUTE 3/C-09
NTS



1. USE A SYNTHETIC FILTER FABRIC OR A PERVIOUS SHEET OF POLYPROPYLENE, NYLON, POLYESTER, OR POLYETHYLENE YARN, WHICH IS CERTIFIED BY THE MANUFACTURER OR SUPPLIER.
   SYNTHETIC FILTER FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABLIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0 TO 120° F.
2. POSTS FOR SEDIMENT FENCES ARE EITHER 4-INCH DIAMETER PINE, 2-INCH DIAMETER OAK, OR 1.33 LB/LINEAR FT. STEEL WITH A MINIMUM LENGTH OF 4 FT. STEEL POSTS SHALL HAVE PROJECTIONS TO FACILITATE FASTENING THE FABRIC.

SILT FENCE 4/C-09
NTS



DOWNCHUTE OUTLET PROTECTION 5/C-09
NTS

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PROJECT MANAGER D.T. DECESARE, P.E.
T.M. YANOSCHAK, P.E.
G.M. WILLIAMS, E.I.
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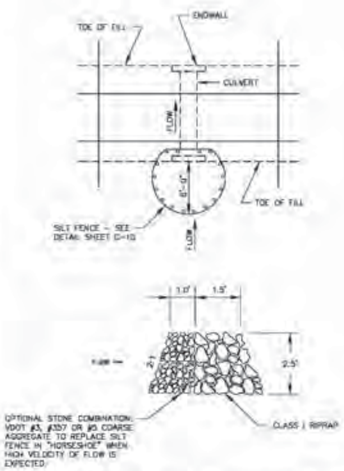
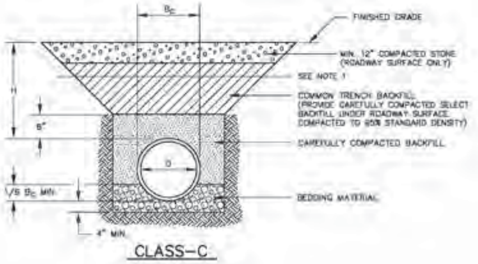
THOMAS M. YANOSCHAK
Lic. No.
Lic. No. 30155
2-21-08

SPSA
Regional Landfill
Cell VII Expansion
Part B Application
SUFFOLK
VIRGINIA

CELLS V-VII DRAINAGE DETAILS
0 1" 2"
FILENAME 00C-20.dwg
SCALE AS SHOWN
SHEET C-20



CULVERT INLET PROTECTION 1 C-02
NTS



CLASS–C

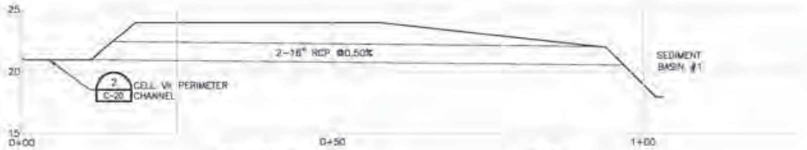
LEGEND

B_C – OUTSIDE DIAMETER
H – BACKFILL COVER ABOVE TOP OF PIPE (3'-0" MINIMUM)
D – INSIDE DIAMETER

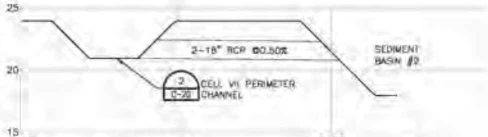
NOTES

1. 8 OZ NON-WOVEN GEOSYNTHETIC FABRIC ROADWAY SURFACE. OVERLAP 2'-0" WITH EXISTING FABRIC.
2. SELECT MATERIAL TO MEET VDOT SECTION 208 TYPE II. MINIMUM CBR OF 10.

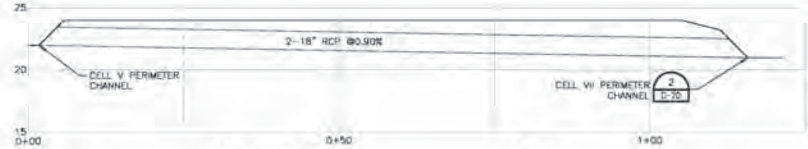
CULVERT PIPE BEDDING 2 C-02
NTS



CULVERT #1 2 C-02
HORIZ: 1"=10' VERT: 1"=5'



CULVERT #2 2 C-02
HORIZ: 1"=10' VERT: 1"=5'



CULVERT #3 2 C-02
HORIZ: 1"=10' VERT: 1"=5'

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PROJECT NUMBER 00002889.018

THOMAS M. YANOSCHAK
8-13-08

SPSA
Regional Landfill
Cell VII Expansion
Part B Application
SUFFOLK VIRGINIA

CULVERT DETAILS

0 1" 2"
FILENAME 00C-21.dwg
SCALE AS SHOWN
SHEET C-21

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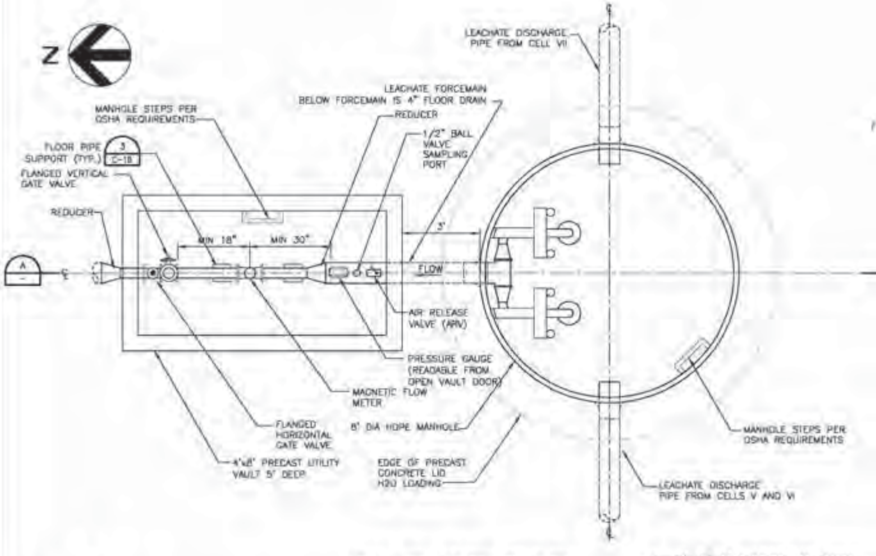
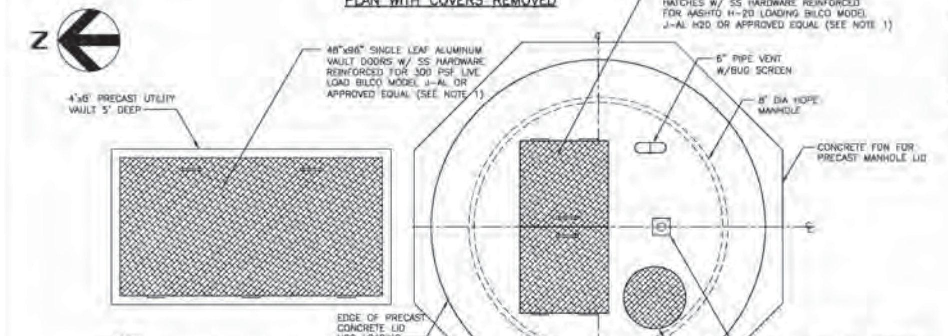


PLAN WITH COVERS REMOVED

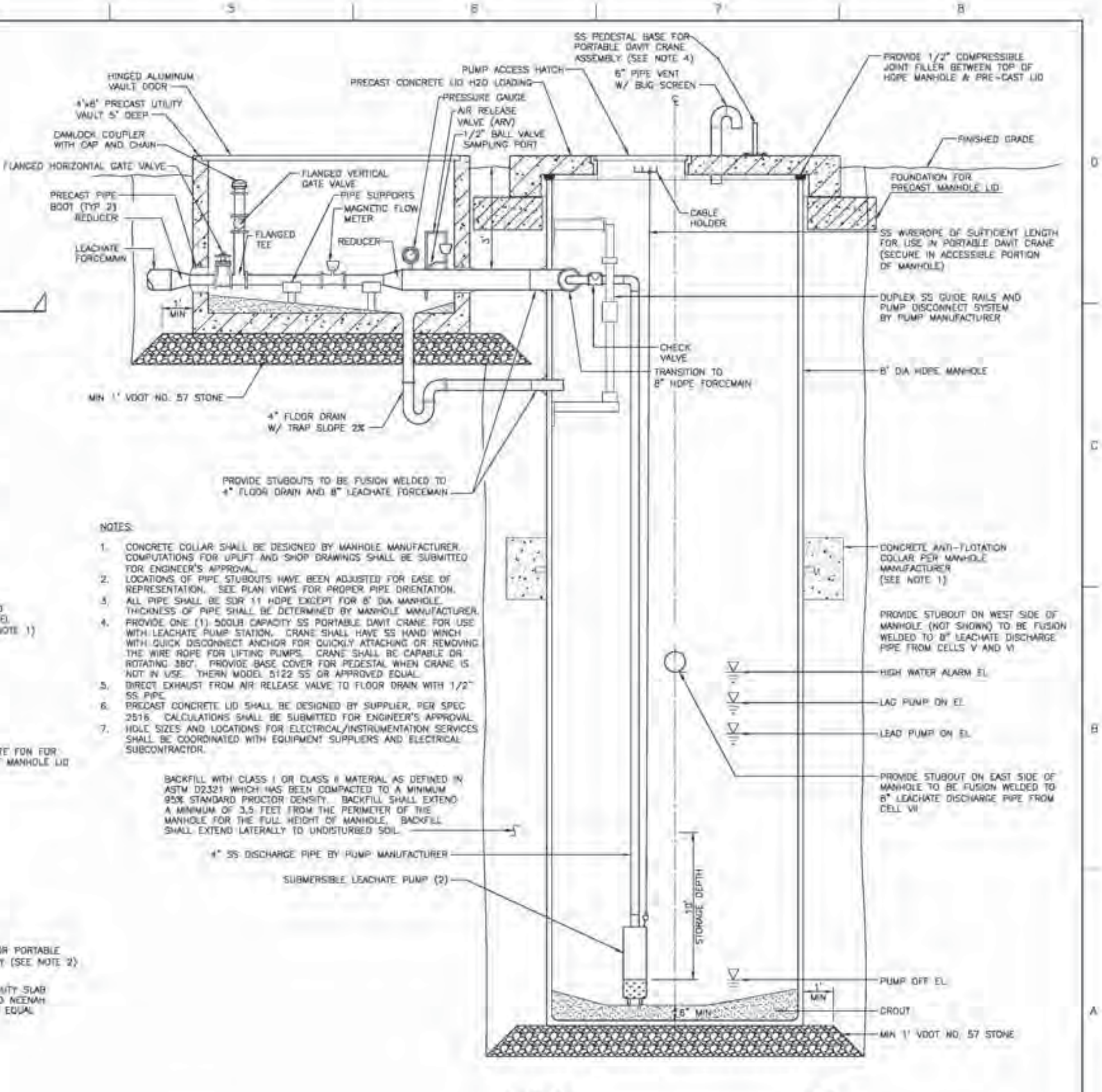


NOTES:

1. DOOR AND MANHOLE FRAMES TO BE PRECAST WITH UTILITY VAULT AND PUMP STATION LID.
2. COORDINATE LOCATION OF PEDESTAL BASE FOR PORTABLE DAVIT CRANE ASSEMBLY WITH PUMP MANUFACTURER AND MANHOLE FABRICATOR TO ENSURE ACCESS TO BOTH PUMPS.
3. ALL HATCHES ON PUMP STATION AND VALVE VAULT SHALL BE LOCKABLE.

COVER PLAN

PROPOSED LEACHATE PUMP STATION PLAN
NOT TO SCALE
1 C-02



NOTES:

1. CONCRETE COLLAR SHALL BE DESIGNED BY MANHOLE MANUFACTURER. COMPUTATIONS FOR UPLIFT AND SHOP DRAWINGS SHALL BE SUBMITTED FOR ENGINEER'S APPROVAL.
2. LOCATIONS OF PIPE STUBOUTS HAVE BEEN ADJUSTED FOR EASE OF REPRESENTATION. SEE PLAN VIEWS FOR PROPER PIPE ORIENTATION.
3. ALL PIPE SHALL BE SDR 11 HDPE EXCEPT FOR 8' DIA MANHOLE. THICKNESS OF PIPE SHALL BE DETERMINED BY MANHOLE MANUFACTURER.
4. PROVIDE ONE (1) 500LB CAPACITY SS PORTABLE DAVIT CRANE FOR USE WITH LEACHATE PUMP STATION. CRANE SHALL HAVE SS HAND WINCH WITH QUICK DISCONNECT ANCHOR FOR QUICKLY ATTACHING OR REMOVING THE WIRE ROPE FOR LIFTING PUMPS. CRANE SHALL BE CAPABLE OR ROTATING 360°. PROVIDE BASE COVER FOR PEDESTAL WHEN CRANE IS NOT IN USE. THERN MODEL 5122 SS OR APPROVED EQUAL.
5. DIRECT EXHAUST FROM AIR RELEASE VALVE TO FLOOR DRAIN WITH 1/2" SS PIPE.
6. PRECAST CONCRETE LID SHALL BE DESIGNED BY SUPPLIER, PER SPEC 2516. CALCULATIONS SHALL BE SUBMITTED FOR ENGINEER'S APPROVAL.
7. HOLE SIZES AND LOCATIONS FOR ELECTRICAL/INSTRUMENTATION SERVICES SHALL BE COORDINATED WITH EQUIPMENT SUPPLIERS AND ELECTRICAL SUBCONTRACTOR.

SECTION
NOT TO SCALE
A

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HDR Engineering, Inc. of the Carolinas

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PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	01743-2889-018

THOMAS M. YANOSCHAK
8-11-08

SPSA
Regional Landfill
Cell VII Expansion
Part B Application
SUFFOLK VIRGINIA

PROPOSED LEACHATE PUMP STATION

0 1" 2"

FILENAME	00C-22.dwg
SCALE	AS NOTED

SHEET
C-22

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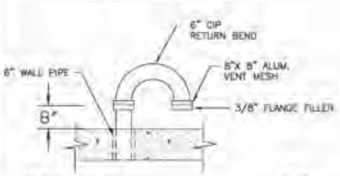
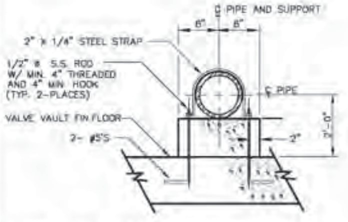


VENT PIPE
NTS
1
–



PIPE SUPPORT
NTS
2
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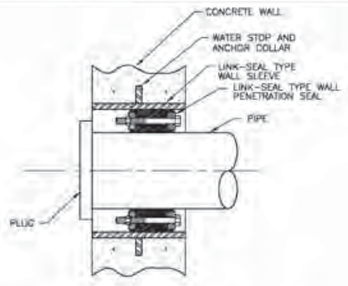
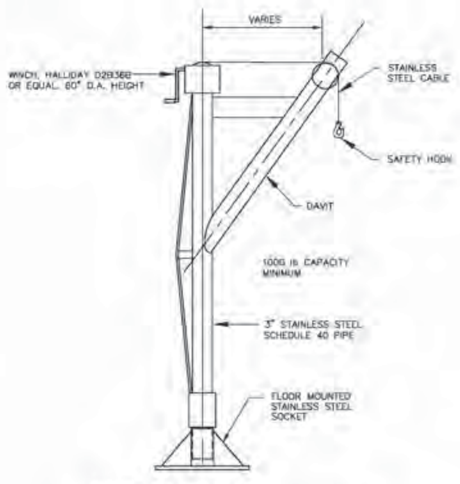


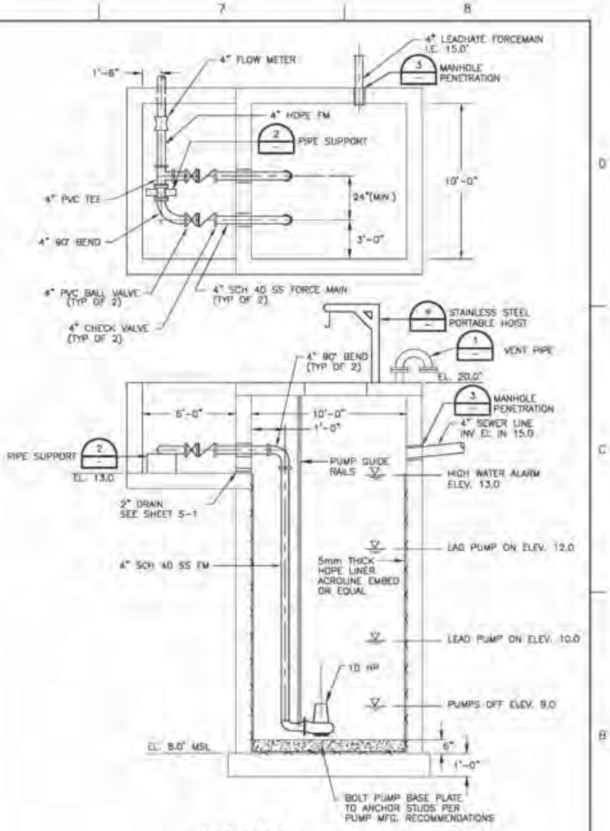
NOTES:

2. BOLT HEADS SHALL FACE INTERIOR OF STRUCTURES, UNLESS OTHERWISE NOTED.

MANHOLE PENETRATION
NTS
3
–



STAINLESS STEEL PORTABLE HOIST
NTS
4
–



WET WELL
NTS
5
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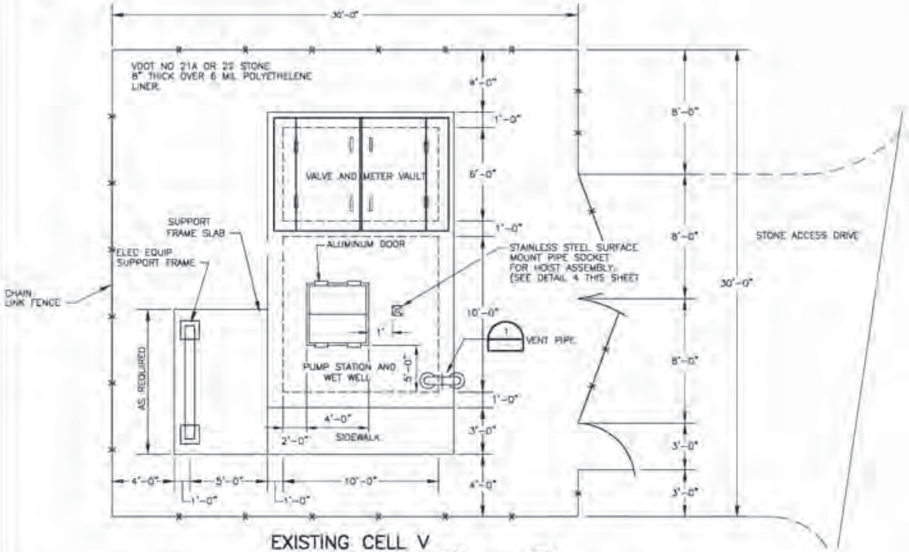

EXISTING CELL V
PUMP STATION PLAN
NTS
6
C-02

HDR

HDR Engineering, Inc.
of the Carolinas

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	01743-2889-018

THOMAS M. YANOSCHAK
Lic. No. 023301
8-27-08

Lic. No. 19550
8-27-08

SPSA

Regional Landfill
Cell VII Expansion
Part B Application

SUFFOLK
VIRGINIA

EXISTING CELL V
PUMP STATION

0 1" 2"

FILENAME	00C-23.dwg
SCALE	AS NOTED

SHEET
C-23

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ATTACHMENT III-2
Technical Specifications

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HDR Engineering, Inc.

Southeastern Public Service Authority

Regional Landfill Cell VII Expansion - Issued for Approval

Technical Specifications

August 2008
Revised April 2010

HDR Project No. 01743-2889-018

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Table of Contents

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - SITE WORK

DIVISION 3 - CONCRETE

DIVISION 11 - EQUIPMENT

DIVISION 13 – SPECIAL CONSTRUCTION

DIVISION 15 - MECHANICAL

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SECTION 01040
COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Coordination of all Work associated with construction/installation in the landfill expansion and closure areas generally related to:
   1. Earthwork.
   2. Underdrain System.
   3. Liner System.
   4. Leachate Management System.
   5. Civil Construction.
   6. Electrical Construction.
   7. Soil Erosion/Sedimentation and Stormwater Control Features.
   8. Completely coordinate work with work of all other trades and contractors.

B. Definitions:
   1. Owner: The Owner is the Southeastern Public Service Authority (SPSA) who owns and/or is responsible for the facility.
   2. Project Manager: The Project Manager is an official representative of the Owner. The Project Manager is HDR Engineering, Inc., of Raleigh, NC. The project manager will be responsible for the CQA program and all CQC soils testing.
   3. Engineer: The Engineer is responsible for the engineering design, drawings, plans, Contract Documents, and Project Specifications. The Engineer is HDR Engineering, Inc., of Raleigh, NC.
   4. Contractor is responsible for all work under this contract performed either in-house or through subcontractors. General Contractor’s responsibilities include, but are limited to, all civil site work, supplying materials, handling and installing geosynthetics, electrical work and mechanical work.
   5. Geosynthetics Manufacturer: The Geosynthetic(s) (e.g., geomembrane, geotextile, etc.) Manufacturer(s) is(are) responsible for the production, quality control, certification of properties, and installation guidelines of the geosynthetic component(s).
   6. Construction Quality Assurance (CQA): CQA is defined as a planned system of activities employed by the Owner to assure that the facility is constructed in conformance with the contract drawings and project specifications. CQA is performed by the CQA Consultant and includes overview of the CQC activities of the Contractor, performing CQA conformance testing, and preparation of a certification report incorporating both CQC/CQA data. The CQA program will be in accordance with the CQA Plan prepared for this project.
   7. Construction Quality Assurance Consultant: The CQA Consultant is a party, employed by the Owner, that is responsible for implementing the CQA Plan. The CQA Consultant's activities include observing the CQC Program, CQA conformance testing, and documenting activities related to the CQC/CQA programs. The CQA Consultant is responsible for issuing a Facility Certification Report, sealed by a Professional Engineer registered in the state of Virginia.
   8. Geosynthetics Construction Quality Assurance Laboratory: The Geosynthetics CQA Laboratory is a party, independent from the Contractor, that is responsible for conducting conformance tests on samples of geosynthetics used in the liner and leachate management systems.
   9. Soils Construction Quality Assurance Laboratory: The Soils CQA Laboratory is a party, independent from the Contractor, that is responsible for conducting tests in the laboratory on samples of soil taken from the borrow source, stockpile, or site.

10. Construction Quality Control (CQC): CQC is defined as a planned system of activities employed by the Contractor to assure that the facility is constructed in conformance with the contract drawings and project specifications. CQC is performed by the CQC Consultant and includes performing CQC testing of facility components, assembly of manufacturer's product certifications, and monitoring of system construction techniques. The CQC program will be in accordance with the requirements of the project specifications.
11. Geosynthetics Construction Quality Control Laboratory: The Geosynthetics CQC Laboratory is a party, independent from the Contractor, that is responsible for conducting tests on conformance samples of geosynthetics used in the liner and collection systems.

1.2 DESCRIPTION OF COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating the sequencing of work, by others, in accordance with the Completion Time presented in Paragraph 1.10 of this Section.

B. Coordinate the work with landfill personnel to avoid disruption of ongoing landfill operations.

C. Coordinate the work with the CQC Consultant and CQA Consultant to avoid interruption of the CQC/CQA Programs.

1.3 MEETINGS

A. In addition to progress meetings hold coordination meetings and conferences with personnel and sub contractors to assure coordination of Work.

1.4 COORDINATION OF SUBMITTALS

A. Schedule and coordinate submittals specified in Sections 01300 and 01340.

B. Coordinate work of various sections having interdependent responsibilities for completion, connecting to, and placing in service.

1.5 TESTING LABORATORY SERVICES

A. CQC Laboratory
   1. Geosynthetics CQC Laboratory
      a. Services by a Geosynthetic CQC Laboratory to perform inspections, tests, and other services required by individual specification sections as defined in these project specifications. CQA will be provided by the Owner at his expense, and geosynthetics CQC will be provided by the Contractor at his expense. Refer to the CQA Plan for details and the lines of communication.
   2. Soil CQC Laboratory
      a. Services by a Soils CQC Laboratory to perform tests and other services required by individual specification sections as defined in these project specifications. CQA will be provided by the Owner at his expense, and soil CQC will be provided by the Contractor at his expense. Refer to the CQA Plan for details and the lines of communication.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. CQC reports will be submitted in accordance with the project specifications to the CQA Consultant and provide observations and results of test, indicating compliance or non-compliance with specified standards and with Contract Documents.

D. Contractor's responsibilities:
   1. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing.
   2. Cooperate with laboratory personnel, and provide access to work.

3. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.
4. Notify Engineer and CQA Consultant 24 hours prior to expected time for operations requiring inspection and testing services.
5. Coordinate civil work with geosynthetic, electrical, and other subcontractors.

1.6 FIELD ENGINEERING

A. Verify locations of survey control points and interface points prior to starting Work. Promptly notify Engineer of any discrepancies encountered.

1.7 LIMITS OF CONSTRUCTION

A. Unless otherwise approved by the Owner, the Contractor shall restrict his operations to within the area defined by "Limits of Construction," "Contract Limits," etc. as noted on the plans.

B. The existing roads are not to be used for parking or other construction operations other than access to the construction area unless authorized by the Owner or Project Manager.

1.8 DRAWINGS AND CONTRACT DOCUMENTS FOR CONTRACTOR USE

A. "No-Charge" Documents. The Engineer will furnish to Contractor, free of charge, upon award of Contract the following documents:
   1. Four (4) sets of full size prints of drawings.
   2. Four (4) booklets of conformed Contract Documents and Project Specifications.

B. Contractor shall pick up all "no-charge" documents within ten (10) days from date of Notice to Proceed.

C. Cost Documents. Additional documents after "No-Charge" documents will be furnished to Contractor at cost.

1.9 SEQUENCING AND SCHEDULING

A. Key PROJECT MILESTONES to be incorporated in Proposed Contract Schedule include, but are not necessarily limited to, the following:
   1. Mobilization: Contractor's option.
   2. Erosion control device installation: Comply with applicable codes, regulations, and in accordance with the State of Virginia’s "Erosion Control Manual."
   3. Shop drawings submittal completion: See Section 01340.
   4. Substantial completion.
   5. Substantial and satisfactory completion (Final completion) for all Work.

B. Hours of Construction. The Contractor may work at the site between the hours of 6:00 a.m. and 8:00 p.m. local time, Monday through Friday, 7:00 am to dusk on Saturdays but no later than 8:00 pm, or as otherwise agreed between the Owner and Contractor.

1.10 SCHEDULING AND COORDINATION PERFORMED BY EACH CONTRACTOR

A. Contract Schedule. Within 15 days after award of contract, Contractor shall submit to Engineer three (3) copies of a time scale network schedule for development of a Project Schedule. Contractor shall prepare and keep updated an overall project schedule including subcontractor activities. This Schedule shall address construction tasks within allotted Contract Time. Schedule shall be of Critical Path Type and include an analysis of critical resources. A general guide for preparing such schedule is contained in "The Use of CPM in Construction, a Manual for Contractors," published by the AGC of America. Account for schedule of Subcontractors. Provide schedule for proper sequence of construction considering various crafts, purchasing time, shop drawing submittal and approval, material delivery, equipment fabrication, and similar time-consuming factors. Show on schedule, as a minimum, earliest starting, earliest completion, latest starting, latest finish, free and total float for each task. Contractor is to evaluate schedule not less than monthly and submit with pay application to show rescheduling necessary to reflect true job conditions. When shortening of various time intervals is necessary to correct for behind schedule conditions, indicate steps to implement to accomplish work in shortest schedule. When schedule revision is required, submit a draft revised schedule and state reason for revision request.

B. If Contractor does not take necessary action to accomplish Work according to Approved Project Schedule, he may be directed by Owner in writing to take necessary and timely action to improve work progress. Such directive may require increased work forces, equipment, shifts, or other action as necessary, but will not be considered as a basis for a claim against the Owner for additional compensation or time. Should Contractor refuse or neglect to take such action authorized, under provisions of this Contract, Owner may take necessary actions including, but not necessarily limited to, withholding of payment, temporary suspension of Work, and termination of Contract.

C. Schedule of Anticipated Payment. Upon receipt of Approved Project Schedule within 10 days, Controller shall submit to Engineer an estimated payment schedule by each month of project duration. Include a composite curve to show estimated value of work complete and stored materials less specified retainage. During the course of work, update with new composite curves at key months or whenever variation is expected to be more than plus or minus 10 percent. Retain original or previous composite curves as dashed curves on all updates. Include a heavy plotted curve to show ACTUAL payment curve on all updates.

D. Contractor shall submit a tentative schedule to the Project Manager prior to the preconstruction meeting. Schedule conflicts shall be resolved in a mutually acceptable manner at the preconstruction meeting. Each Contractor shall bring the appropriate people to that meeting to resolve the schedules. The schedule shall include consideration for normal weather conditions.

E. After the schedule is agreed to by all parties any damages resulting due to missed deadlines shall be the responsibility of the party missing the deadline.

F. The schedule may be revised at any time, provided that the Contractor, the Owner and the project manager agree.

1.11 COMPLETION AND CONSTRUCTION SCHEDULE

A. The anticipated schedule is as follows:
1. Notice of Award: to be determined
2. Notice to Proceed: to be determined
3. Substantial Completion: to be determined
4. Final Completion: to be determined

B. Definition of Substantial Completion:
1. In order to obtain a Permit to Operate the landfill unit under construction, the Engineer, on behalf of the Owner, must submit a comprehensive Certification Report to the regulating authority for approval. All CQC documentation, including as-built surveys, collected by the Contractor will be included in the Engineer's Certification Report.
2. Substantial Completion requires that, at a minimum, Contractor has met the following criteria:
   a. That Work has been completed satisfactorily such that, pending regulatory approval, the Owner can occupy the site and use it for its intended purpose.
   b. That the CQC consultant has completed all required testing, has obtained and verified all test results, and results indicate that the work is in accordance with the contract requirements.
   c. That the Contractor’s surveyor has completed all required surveys, has verified all lines and grades. The surveys indicate that the work conforms to the contract requirements.

d. That the Contractor has obtained, reviewed, and submitted all geosynthetic CQC documents to the Engineer with a certification stating that the documents have been thoroughly reviewed by the Contractor and that all conditions of the Contract regarding CQC documentation have been met. Interim preliminary or final testing or survey results transmitted to the Engineer during progression of the Work shall not be construed to represent submittal of information required above. The Contractor and CQC consultants shall compile all information obtained throughout construction for a complete and comprehensive submittal.

C. Definition of Final Completion: Completed including final inspections, correction of punch list items, and providing the Owner with all close-out documents required by the Contract. Refer to the General Conditions.

1.12 LIQUIDATED DAMAGES

A. The Owner is currently operating a Municipal Solid Waste (MSW) Unit with limited remaining capacity.

B. Contractor recognizes that time is of the essence of this Agreement and that the Owner will suffer financial loss if the Work is not substantially completed within the time specified in Paragraph 1.11 above, plus any extensions thereof allowed in accordance with the General Conditions. The Contractor also recognizes that the timely performance of services by other parties involved in the Owner's Project are naturally dependent upon Contractor's specific compliance with the requirements of Paragraph 1.11. Further, Contractor recognizes the delays, expense, and difficulties involved in proving, in a legal proceeding, the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that, as liquidated damages for delay (but not as a penalty), Contractor shall pay the Owner the following:

For Each Day Beyond the Required Substantial Completion Date (Each)	$1,000
For Each Day Beyond the Final Completion Date	$1,000
Plus any direct costs to the Owner caused by the delay.	

C. Depending on actual completion dates, liquidated damages for each Phase of Work may be cumulative.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01060

SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 CONDITIONS SPECIFIC TO THIS PROJECT

A. Completion and Construction Schedule:
   1. The anticipated schedule for this project is outlined in Section 01040 – Coordination.
   2. Changes in the anticipated schedule dates will not be a basis for allowing a change in Contract Price. If the work specified under this Contract is amended in accordance with provisions of these Contract Documents, the approved changes will be a basis for extending the completion dates of this Contract.
   3. The start of construction and substantial completion of construction shall be extended for the period of any delays requested by the Owner. Extension of time will be equal to the number of calendar days of such delay.

B. Construction Limits:
   1. Construction limits are depicted on the Drawings. The Contractor may obtain soil material for use in the Work only in areas designated for revised grades. That is, the only borrow source material available to the Contractor is in areas where excavation is required to met design subgrade elevations.
   2. The Contractor is to conduct construction activities such that there is no damage to any piezometers or wells (gas or water monitoring) on the project site. The Contractor will be held financially responsible for damage to the piezometers or wells.

C. Site Access:
   1. The only access to the site available to the Contractor is entering through the main landfill entrance on Bob Foeller Drive.
   2. Existing Disposal Activities: The Contractor is hereby advised that the project is located on the existing Regional Landfill property. As such, there is a fair degree of traffic and activity during the course of normal disposal operations. The normal operation hours are described elsewhere in this Section. Further, the Owner maintains records of waste deliveries which may be available for inspection by the Contractor. The Contractor is cautioned that waste deliveries and other landfill traffic are not to be interfered with unless prior written authorization has been granted by the Owner.

D. Basis of Payment for Excavated Quantities:
The Contractor shall employ a registered surveyor to survey the site during construction. Survey shall be completed on the same grid or other approved system throughout the duration of the project. Contractor shall review findings with Engineer and Owner. Engineer and Owner shall perform verifying survey if deemed necessary. If necessary, Owner will use findings to adjust pay items. Owner will make final determination of adjustment, if necessary.

E. The Contractor shall be responsible for maintenance and restoration of all access including on-site haul roads, existing stone access roads, road shoulders, and existing erosion and sediment control features within the construction limits.

F. Dust Control:

The Contractor may obtain water from surrounding erosion control devices for dust control.

G. Construction Equipment:
   1. The Contractor shall be aware of the residential surroundings of the site. The Owner is concerned about excessive noise, and smoke, and dust caused by operating equipment.
   2. The Owner reserves the right to reject any construction equipment deemed to be a public nuisance.

3. Contractor shall only use construction equipment on-site that was manufactured later then the mid-1980’s. Equipment must have functional exhaust and muffler systems meeting original equipment manufacturer’s (OEM) specifications.

1.2 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference shall be held at the landfill after award of Contract. Engineer will notify the Contractor as to the date and time of the conference in advance of the proposed date. Contractor’s Project Manager and Project Superintendent and Contractor’s Subcontractor Representatives shall attend.

1.3 PROJECT SIGNS

A. Project signs are not allowed at the landfill entrance. The Contractor may place a sign near the field office location shown on the drawings.

1.4 FIELD OFFICES, GENERAL

A. Location as shown on the Drawings.

B. Contractor to provide water service from a location approved by the Owner.

C. Contractor to provide power service from a location approved by the Owner.

D. Contractor to provide tank and periodic pumping service for collection of wastewater from offices.

1.5 CONTRACTOR'S SUPERINTENDENT'S FIELD OFFICE

A. Establish within the construction limits as shown on the drawings.

B. Equipment: Telephone, facsimile, mailing address, and sanitary facilities. Owner will pay for costs associated with the temporary connection of telephone and power through the Total Bid. Contractor shall provide Porta-John and bottled water.

C. Assure attendance at this office during the normal working day.

D. At this office, maintain complete field file of shop drawings, posted Contract Drawings and Specifications, and other files of field operations including provisions for maintaining "As Recorded Drawings."

E. Remove field office from site upon approval by Owner and immediately prior to acceptance of the entire work by the Owner.

1.6 ENGINEER'S/CQA CONSULTANT'S FIELD OFFICE

A. Separate from Contractor's field office.

B. General Construction:
  1. New or reconditioned mobile office trailer.
  2. Baked enamel aluminum siding.
  3. 3 1/2 IN foil backed fiberglass insulation throughout.
  4. Interior paneling.
  5. Vinyl tile flooring.
  6. 8 FT high acoustic tile ceiling.
  7. Three private office areas, one reception-conference room area, and private washroom.
  8. Windows:
     a. Minimum two per room, excepting washroom, with one each on opposing walls.
     b. Combination screen-storm windows.
     c. Provide horizontal louver blinds on each window.
  9. Nominal 840 SQ. FT.
  10. Two exterior doors (with cylinder deadbolt locks) with outer screens, exterior lights and exterior landings, stairs and railings.

11. A sketch of interior configuration shall be provided to the Engineer for approval prior to delivery of unit to Project Site.

C. Electrical System:
   1. All fixtures, outlets, and wiring of Underwriters Laboratory (UL) approved devices.
   2. All circuits protected by circuit breakers; fuses are not acceptable.
   3. Electrical system shall meet requirements of the latest National Electric Code.
   4. System suitable for 220 V, 3 PH service.
   5. Any transformers or other devices required to match this supply to the mobile office shall be provided and connected.
   6. Provide a circuit breaker for the incoming service.
   7. Each interior room except the washroom shall have at least four 110 V duplex electrical convenience outlets.

D. Central Combination Electric Heating, Air-Conditioning System:
   1. Fan-forced air.
   2. Thermostatically controlled.
   3. Individual room units are not acceptable.
   4. Freeze protect and insulate all piping.
   5. System sized to maintain 75 DegF constant temperature in each room.

E. Lighting System:
   1. Fluorescent type producing 100 footcandles at desk top height.
   2. Ample ceiling fixtures provided to ensure adequate lighting throughout.

F. Standard Washroom:
   1. Flush toilet, sink, hot and cold running water.
   2. Electric water heater.
   3. Mirror.
   4. Electric ceiling or wall vent.
   5. Sound insulated partitions.

G. Water Supply
   1. Provide bottled drinking water with electric cooler for field offices.

H. Furnishings:
   1. Full width built-in desk at end of each office, with a nominal depth of 30 IN and overhead book shelves 12 IN deep.
   2. Three desks, 36 x 72 IN long with locking lap drawer.
   3. One plan table 39 x 72 x 36 IN wide, with one locking equipment drawer.
   4. One 48 x 60 IN liquid marking board with minimum four-color set of compatible markers.
   5. One 48 x 60 IN cork bulletin board.
   6. Two four-drawer legal size filing cabinets.
   7. Two, two drawer filing cabinets with locking drawers.
   8. Three cushioned swivel arm chairs.
   9. Ten folding chairs.
   10. One nominal 3 FT plan racks that hold a minimum of six, 200 sheet sets of 24 x 36 IN Drawings.
   11. Three bookcases, composed of three shelves 36 IN long and 12 IN wide. The unit shall be a minimum of 3 FT high.
   12. Three standard size waste paper baskets.
   13. Conference table to accommodate ten chairs.
   14. Rain gauge.
   15. Outdoor thermometer.
   16. Two tables 36 IN x 60 IN.
   17. Refrigerator: 2.5 CF min.

I. Maintenance:

1. Contractor shall provide all maintenance and upkeep of trailer and equipment. Equipment breakdowns shall be repaired promptly by Contractor.
2. Janitorial service.
    a. Weekly:
        1) Floor sweeping using dust suppressing compound.
        2) Wet mopping with floor detergent.
    b. Inclement weather: Conduct weekly requirements on daily basis.
    c. Monthly: Wash windows and clean window blinds.
3. Provide private touch tone telephone service with three lines and three sets capable of long distance service and three answering machines. Contractor to pay for telephone service and long distance service.
4. Provide facsimile and copy machines in Engineer's Field Office.
5. Pay all utilities costs.
6. Maintain at least until acceptance of the entire work by the Owner or until otherwise suspended by the Engineer.
7. Provide and pay for local internet provider.

J. Remove field office from site upon approval by Owner after acceptance of the entire work by the Owner.

K. Maintain conditions of access road to site such that access is not hindered as the result of construction related deterioration.

1.7 DRAWINGS SHOWING CHANGES DURING CONSTRUCTION

A. The Contractor shall maintain a set of Plans and Specifications marked “Construction Record Drawings.” The Contractor shall keep a complete and up-to-date record in red pencil of any and all changes made during construction. This set of Contract Documents shall be submitted to and approved by the Engineer prior to final payment.

1.8 SPECIAL CONSIDERATIONS

A. Contractor shall be responsible for negotiations of any waivers or alternate arrangements required to enable transportation of materials to the site.

B. Maintain conditions of all roads such that access is not hindered as the result of construction related deterioration.

C. Maintain in good repair temporary structures, fences, barricades, and other related items.

D. Store and stockpile materials in an orderly manner and protect against damage.

E. Electrical Power and Lighting. The electrical power required during construction shall be provided by each Contractor as required by him. This service shall be installed by a qualified electrical contractor. Lighting shall be provided by each Contractor in all spaces at all times where necessary for good and proper workmanship, for inspection or for safety.

F. Safety. The Contractor alone shall be solely and completely responsible for conditions of the job site in connection with his work, including safety of all persons and property, preparatory to and during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.

1. The Construction Documents, and the construction hereby contemplated are to be governed, at all times, by applicable provisions of local and State laws and regulations, and Federal laws, including but not limited to, the latest amendments of the following: Department of Labor, Bureau of Labor Standards Safety and Health Regulations for Construction, and Williams and Steiger Occupational Safety and Health Act of 1970, including rules and regulations pursuant thereto , applicable to the Work and performance of the Contract (OSHA).
2. The duty of the Engineer to conduct construction review of the Contractor’s performance is not intended to include review of the adequacy of the Contractor’s safety measures in, on, or near the construction site.

3. All explosives shall be stored in a secure manner and all storage places shall be marked clearly “DANGEROUS EXPLOSIVES”, and shall be in the care of competent watchmen at all times.

G. Inspections by Federal and State Agencies. Authorized representatives and agents of the State and Federal Government shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

H. Water. Water used on the project shall be fresh and of drinkable quality. Water obtained from nearby streams will not be acceptable for use on the project. The Contractor shall make arrangements to purchase fresh water for his drinking and normal use.

I. Sanitary facilities required during construction shall be provided by each Contractor as required by him.

J. Telephone service required during construction shall be provided by each Contractor as required by him.

K. Order of Construction: Construction operations will be scheduled to allow the Owner uninterrupted operation of existing adjacent facilities.

1.9 DATA AND MEASUREMENTS

A. The data given in the specifications and shown on the Plans and Drawings is believed to be accurate but the accuracy is not guaranteed. The Contractor must take all levels, locations, measurements, and verify all dimensions of the job site prior to construction and must adapt his work into the exact construction. Scale measurements taken from prints are not considered for more than reference, larger scale drawings take precedence over smaller scale, and shop drawings take precedence over all others.

B. Topographic surveys of the following components shall be submitted to the Engineer for review during construction:

1. Subgrade – topo of the area prior to excavation.
2. Basegrade – topo of the area after excavation.
3. Geologic buffer layer.
4. Leachate collection system.
5. Protective cover soil.

C. Final as-built survey shall be sealed by a registered land surveyor in the Commonwealth of Virginia and submitted to the Engineer. The Contractor shall provide the Engineer with an electronic version of the sealed survey in Auto Cad 2000 format or equivalent. Final as-built survey shall include the following:

1. Location of roads.
2. Inverts of pipe and pipe locations.
3. Erosion control structures.
4. Surface of operational cover.
5. Subcell divider berms/access ramp.
6. Leachate enclosures.
7. Culvert inverts.
8. Light poles/fire hydrants.
9. Location of ditches.
10. Location of berms.
11. Location of sediment basins and sediment traps.
12. Location of underground power.
13. Locations of existing roads that were either paved or repaved.
14. Leachate pump station.
15. Leachate tank.

1.10 OWNER FACILITIES

A. Owner facilities at the landfill entrance complex are OFF-LIMITS to all Contractor's personnel.

1.11 REFERENCE POINTS

A. Horizontal and vertical control points will be established by the Owner, in accordance with the General Conditions. Contractor shall preserve and protect all reference points and pay for replacement of any destroyed reference points.

1.12 PROJECT PHOTOGRAPHS

A. Ground Photography.
   1. During the contract period, the contractor shall document construction of all work with photography. The photographs shall be given to the owner each month with all rights of reproduction. Imprint on each ground photograph the site name, date photograph was taken and include description of work being performed for each picture. The photos must be of adequate clarify and quality to illustrate the work.

1.13 SITE CONDITIONS

A. The Contractor acknowledges that he has investigated prior to bidding and satisfied himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, water tables, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done on behalf of the Owner on the site or any contiguous site, as well as from information presented by the drawings and specifications made a part of this Contract, or any other information made available to him prior to receipt of Bids. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the Owner.

1.14 CLEANUP REQUIREMENTS

A. Cleanup operations shall be conducted daily.
   1. Contractor shall keep the work areas free at all times from accumulations of waste materials and rubbish.
   2. Volatile waste shall be properly stored in covered metal containers and removed daily.
   3. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

B. Contractor shall make the necessary arrangements for proper off-site storage areas.

C. Contractor shall keep all equipment and materials within construction easements and protect private property from damage due to construction.

D. See Section 01700.

E. Methods for controlling dust are to conform to Virginia Regulations.

F. All costs associated with the provisions of dust control shall be included in the contractor's firm base bid price. No additional payment shall be made to the contractor for work, materials, labor, equipment, and/or services necessary for or incidental to the provision of required dust control measures.

1.15 HISTORICAL AND ARCHAEOLOGICAL

A. If during the course of construction, evidence of deposits of historical or archaeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Owner. No further disturbance of the deposits shall ensue until the Contractor has been notified by the Owner that Contractor may proceed. Compensation to the Contractor, if any, for lost time or changes in construction resulting from the find, shall be determined in accordance with changed or extra work provisions of the Contract Documents.

1.16 INTERFACE FRICTION TESTS

A. Laboratory interface friction tests shall be conducted by the Contractor on the materials selected to be used in the Work. Test the interfaces between the following adjacent materials.

Material	Spec Section
Leachate Collection Layer	02240
Geocomposite	02990 and 02999
60 Mil Textured HDPE	02775
Geosynthetic Clay Liner (GCL)	02800
40 Mil textured HDPE	02775
Geologic Buffer Layer	02275

B. The testing shall be performed in accordance to ASTM D5321.

1. The materials shall be tested at normal stresses of 500, 1,000, and 1,500 psf. Displacement rates shall be in accordance with ASTM D5321 Procedure A for geosynthetic to geosynthetic interfaces and Procedure B for soil to geosynthetic interfaces. Soil components shall be compacted to the same moisture-density requirements specified for full-scale field placement and saturated prior to shear. All geosynthetic interfaces shall be tested in a wet condition. Geosynthetics shall be oriented such that the shear force is parallel to the downslope orientation of these components in the field. The testing laboratory shall confirm this criteria with the Engineer prior to performing the tests.

C. A minimum friction angle of 25 degrees is required for each interface in the final cover system of a 3H:1V slope with a minimum adhesion of 50 pounds per square foot. The minimum interface friction angle required for the base liner system of a 4H:1V slope is 21 degrees. The components of these systems are found in paragraph A.

D. Materials anticipated to be installed must be tested for approval prior to shipping to the site. Subsequently the materials shipped to the site must be tested.

1.17 BARRIERS

A. Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Restore all disturbed areas to original condition unless otherwise noted.

END OF SECTION

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SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor participation in preconstruction and/or meetings.

B. Contractor participation at progress meetings and pre-installation conferences.

1.2 RELATED REQUIREMENTS

A. Section 01040 – Coordination.

B. Construction Quality Assurance/Quality Control Plan.

1.3 PRECONSTRUCTION CONFERENCE

A. Project Manager will schedule and administer a conference after Notice of Award of the Contract.

B. Attendance: Owner, Engineer, Contractor, Project Manager, Health and Safety Inspector (provided and paid for by the Contractor), and Environmental Coordinator (as deemed necessary by the Owner).

C. Agenda (including, but not limited to):
   1. Distribution of Contract Documents by Engineer.
   2. Distribution of list of Subcontractors, list of products, schedule of values, and progress schedule by Contractor(s).
   3. Designation of responsible personnel.
   4. Procedures and processing of field decisions, corresponding submittals, substitutions, applications for payments, proposal requests, change orders, and Contract procedures.
   5. Agree on Construction Schedule.
   6. Review lines of communication.
   7. Review methods for documenting and reporting, and for distributing documents and reports.
   8. Soils testing requirements for structural fill and other work.
   9. Establish protocols for handling deficiencies, repairs, and retesting.
   10. Other topics of concern.

1.4 GEOLOGIC BUFFER LAYER PRECONSTRUCTION MEETING

A. Project Manager will schedule and administer a pre-construction meeting within seven (7) days prior to the start of geologic buffer layer system construction/installation.

B. Attendance: Owner, Engineer, Contractor, CQA Consultant, and Project Manager.

C. Agenda (including but not limited to):
   1. Review the critical design details of the project.
   2. Review the lines of communication and responsibilities for the overall CQA/CQC programs to be conducted.
   3. Reach a consensus on quality control procedures, especially on acceptance criteria for the geologic buffer layer system.
   4. Select testing equipment and review protocols for testing and placement of general earthwork.
   5. Confirm methods for geologic buffer layer material selection, testing, acceptable zone determination, and test strip installation.
   6. Confirm the methods for documenting and reporting, and for distributing documents and reports.

7. Confirm the lines of authority and communication.

1.5 GEOMEMBRANE PRECONSTRUCTION MEETING

A. Project Manager will schedule and administer a preconstruction meeting within seven (7) days prior to the start of geosynthetic liner system construction/installation.

B. Attendance: Owner, Engineer, Contractor, Geosynthetics Installer, CQA Consultant, and Project Manager.

C. Agenda (including, but not limited to):
   1. Make any appropriate modifications to the approved Geomembrane Installer's Field Installation Procedures Manual.
   2. Review the responsibilities of each party.
   3. Review lines of authority and communication.
   4. Review methods for documenting and reporting, and for distributing documents and reports.
   5. Establish protocols for testing.
   6. Establish protocols for handling deficiencies, repairs, and retesting.
   7. Review the time schedule for all operations.
   8. Establish rules for writing on the geomembrane, i.e., who is authorized to write, what can be written, and in which color.
   9. Outline procedures for packaging and storing archive samples.
   10. Review panel layout and numbering systems for panels and seams.
   11. Establish procedures for use of the extrusion seaming apparatus, if applicable.
   12. Establish procedures for use of the fusion seaming apparatus, if applicable.
   13. Finalize field cutout sample sizes.
   14. Review seam testing procedures.
   15. Review repair procedures.
   16. Review subgrade component acceptance.

D. Refer to the accompanying CQA Plan.

1.6 PROGRESS MEETINGS

A. Project Manager will schedule and administer project meetings as required during construction. Project Manager will make physical arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to participants and those affected by decisions made at meetings.

B. Attendance: Contractor superintendent and major Subcontractors; Owner (as deemed necessary), Project Manager, Representatives of all other Contractors involved in the project, and CQC and CQA Consultants. The Engineer shall attend as requested by the Owner.

C. Suggested agenda: Review of work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, scheduled work by other Contracts, coordination between Contractors, and other items affecting progress of work.

D. Refer to the CQA Plan for additional information.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01340

SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Mechanics and administration of the submittal process for:
    a. Shop Drawings.
    b. Samples.
    c. Miscellaneous submittals.
    d. Operation and maintenance manuals.

B. Related Sections include but are not necessarily limited to:
  1. General Terms and Conditions.
  2. Division 1 - General Requirements.
  3. Sections in Divisions 2 through 16 identifying required submittals.

1.2 DEFINITIONS

A. Shop Drawings:
  1. All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
  2. Product data and Samples are to be submitted as Shop Drawing information.

B. Miscellaneous Submittals:
  1. Submittals other than Shop Drawings.
  2. Representative types of miscellaneous submittal items include but are not limited to:
    a. Construction schedule.
    b. Concrete, soil compaction, and pressure test reports.
    c. Manufacturer's installation certification letters.
    d. Instrumentation and control startup reports.
    e. System performance test reports.
    f. Warranties.
    g. Service agreements.
    h. Construction photographs per Section 01060 – Special Conditions.
    i. Survey data.
    j. Cost breakdown (Schedule of Values).
    k. Health and safety plans.

1.3 SUBMITTAL SCHEDULE

  1. Schedule of Shop Drawings:
    a. Contractor shall submit a schedule of anticipated shop drawings for Engineer’s review and approval within 15 days of receipt of Notice to Proceed.
    b. Schedule shall account for multiple transmittals under any Specification Section where partial submittals will be transmitted.
  2. Shop Drawings:
    a. Submittal and approval of all shop drawings is required prior to 50 percent completion.
  3. Operation and Maintenance Manuals and Equipment Record Sheets:
    a. Initial submittal within 60 days after date Shop Drawings are approved.

1.4 TRANSMITTAL OF SUBMITTALS

A. Transmit all submittals to:

HDR Engineering, Inc.
3733 National Drive Suite 207
Raleigh, North Carolina 27612
Attn: Doug DeCesare, PE

B. Transmittal Form
  1. Utilize the attached Submittal Form to transmit all Shop Drawings, Samples, Miscellaneous Submittals, and Operation & Maintenance Manuals.
    a. Check the appropriate box at the top of the form to indicate the type of submittal.

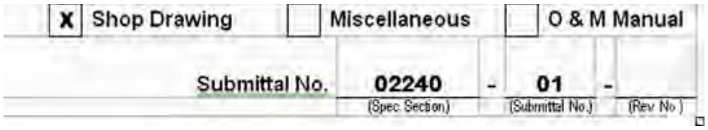
C. Shop Drawings:
  1. For 8-1/2 x 11 IN size sheets, provide three (3) copies of each page for Engineer plus the number required by the Contractor.
    a. The number of copies required by the Contractor will be defined at the Preconstruction Conference, but shall not exceed 5.
  2. For drawings and information larger than 11 x 17 IN, submit one reproducible transparency or camera-ready quality print and one additional print of each drawing until approval is obtained.
    a. Utilize mailing tube; do not fold.
    b. The Engineer will mark and return the reproducible to the Contractor for his reproduction and distribution.

D. Miscellaneous Submittals
  1. Submit in triplicate or as specified in individual Specification Section.
  2. Provide copy of letter of transmittal to Owner's Resident Project Representative.
    a. Exception for concrete, soils compaction and pressure test reports:
      1) Testing firm to transmit one copy directly to CQA representative and one copy directly to Engineer.

E. Operation and Maintenance Manuals
  1. Submit two copies until approval is received.

1.5 PREPARATION OF SUBMITTALS

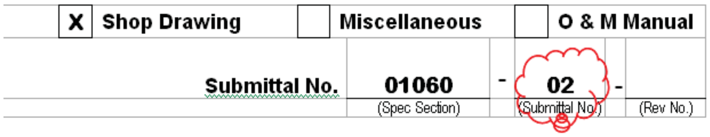
A. Numbering of submittals:
  1. The submittal number shall consist of the Specification Section number followed by a series number beginning at "01" and indicating the order of shop drawings as they are submitted by the Contractor, regardless of the type of submittal.
    a. Examples:
      1) First shop drawing submitted.



☒ Shop Drawing ☐ Miscellaneous ☐ O & M Manual

Submittal No. 02240 - 01 -
(Spec Section) (Submittal No.) (Rev No.)

      2) Second shop drawing submitted.



☒ Shop Drawing ☐ Miscellaneous ☐ O & M Manual

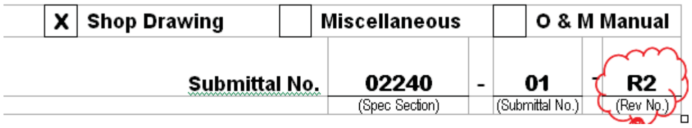
Submittal No. 01060 - 02 -
(Spec Section) (Submittal No.) (Rev No.)

B. Resubmittals:
  1. Utilize a new transmittal form for each resubmittal.
  2. Do not increase the scope of any prior transmittal.

3. Account for all components of prior transmittal.
    a. If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.
        1) Do not include submittal information for items with prior "A" or "B" Action in transmittal.
    b. Indicate "Outstanding-To Be Resubmitted at a Later Date" for any prior "C" or "D" Action item not included in resubmittal.
4. Obtain Engineer's prior approval to exclude items.
5. Number each resubmittal using the original submittal number with the addition of a suffix consisting of “R” with a series number identifying the resubmittal sequence for that specific shop drawing.
    a. Examples:
    1) First resubmittal.

☒ Shop Drawing	☐ Miscellaneous		☐ O & M Manual		
Submittal No.	02240	-	01	-	R1
	(Spec Section)		(Submittal No.)		(Rev No.)

    2) Second resubmittal.



☒ Shop Drawing	☐ Miscellaneous		☐ O & M Manual		
Submittal No.	02240	-	01	-	R2
	(Spec Section)		(Submittal No.)		(Rev No.)

C. Contractor Stamping
1. All submittals must be from Contractor and bear his approval stamp.
    a. Submittals will not be received from or returned to subcontractors.
2. Stamp Content
    a. Shop Drawing submittal stamp shall consist of the following or equivalent wording:

    > "(Contractor's Name) has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval as stipulated under EJCDC General Conditions Paragraph 6.17D".

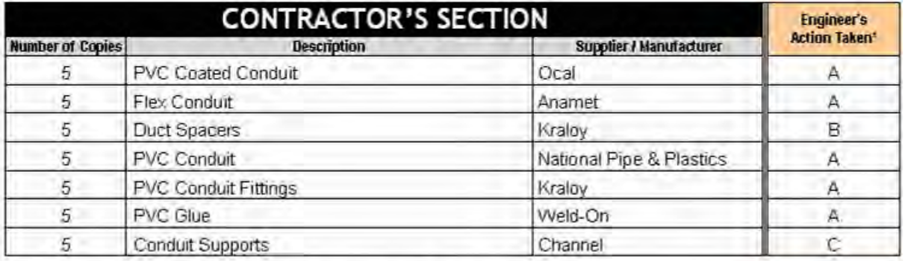
    b. Operation and Maintenance Manual submittal stamp may be Contractor's standard approval stamp.
    c. Contractor's signature and date shall be original ink signature.
3. Contractor's review and approval stamp shall be applied either to the letter of transmittal or a separate sheet preceding each independent item in the submittal.
    a. Letters of transmittal may be stamped only when the scope of the submittal is one item.
    b. Submittals containing multiple independent items shall be prepared with an index sheet for each item listing the discrete page numbers for each page of that item, which shall be stamped with the Contractor's review and approval stamp.
        1) Individual pages or sheets of independent items shall be numbered in a manner that permits Contractor's review and approval stamp to be associated with the entire contents of a particular item and vice-versa.
    c. In the event submittals are transmitted as a single item and found to include multiple independent items, the Owner and Engineer reserve the right to limit review to the single item listed, remove the other items from the submittal, and return them, not reviewed, to the Contractor for coordination, stamping and submittal under a new transmittal number that is not a re-submittal number.
        1) The items not listed in the transmittal letter will not be logged as received, or in any other manner acknowledged as submitted.
4. Electronic stamps

a. Contractor may electronically embed Contractor's review and approval stamp to either the letter of transmittal or a separate index sheet preceding each independent item in the submittal.

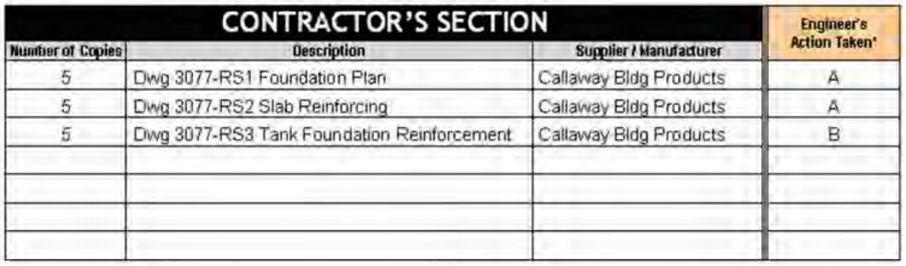
b. Contractor's signature and date on electronically applied stamps shall be original ink signature.

D. Submittal Contents

1. Scope of any submittal and letter of transmittal.
    a. Limited to one Specification Section.
    b. Do not submit under any Specification Section entitled (in part) "Basic Requirements".
    c. Related submittals may be cross referenced as necessary.
2. Provide submittal information defining specific equipment or materials utilized on the project.
    a. Provide listing of each component or item in submittal capable of receiving an independent review action.
        1) Examples:

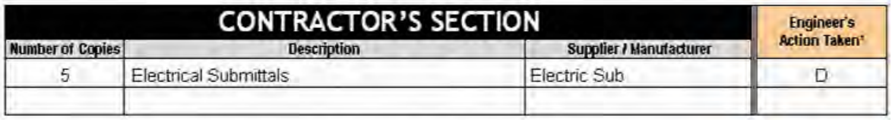


CONTRACTOR'S SECTION			Engineer's Action Taken[1]
Number of Copies	Description	Supplier / Manufacturer	
5	PVC Coated Conduit	Ocal	A
5	Flex Conduit	Anamet	A
5	Duct Spacers	Kraloy	B
5	PVC Conduit	National Pipe & Plastics	A
5	PVC Conduit Fittings	Kraloy	A
5	PVC Glue	Weld-On	A
5	Conduit Supports	Channel	C

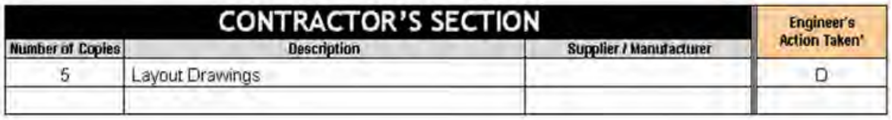


CONTRACTOR'S SECTION			Engineer's Action Taken[1]
Number of Copies	Description	Supplier / Manufacturer	
5	Dwg 3077-RS1 Foundation Plan	Callaway Bldg Products	A
5	Dwg 3077-RS2 Slab Reinforcing	Callaway Bldg Products	A
5	Dwg 3077-RS3 Tank Foundation Reinforcement	Callaway Bldg Products	B

    b. Generalized product information, not clearly defining specific equipment or materials to be provided, will be rejected.
        1) Examples:



CONTRACTOR'S SECTION			Engineer's Action Taken[1]
Number of Copies	Description	Supplier / Manufacturer	
5	Electrical Submittals	Electric Sub	D



CONTRACTOR'S SECTION			Engineer's Action Taken[1]
Number of Copies	Description	Supplier / Manufacturer	
5	Layout Drawings		D

3. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the Engineer.
    a. Identify for each item:
        1) Manufacturer and Manufacturer's drawing or data number.
        2) Contract Document tag number(s).
        3) Specification Article/Paragraph number if appropriate.
        4) Unique page numbers for each page of each separate item.
    b. Identify equipment or material use, tag number, drawing detail reference, weight, and other project specific information.

    c. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
    d. Submit items like equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8-1/2 x 11 IN pages. Indicate exact item or model and all options proposed.
    e. Include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout drawings, parts catalogs, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data.
        1) Arrange data and performance information in format similar to that provided in Contract Documents.
        2) Provide, at minimum, the detail provided in the Contract Documents.
4. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet.
5. Calculations required in individual Specification Sections will be received for information purposes only, as evidence calculations have been performed by individuals meeting specified qualifications, and will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.
6. Provide clear space (3 IN SQ) for Engineer stamping of each component defined on the transmittal form.
7. Contractor shall not use red color for marks on transmittals.
    a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible.
    b. Outline Contractor marks on reproducible transparencies with a rectangular box.

E. Samples:
1. Identification:
    a. Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Standard Specification Section or drawing detail reference, color, range, texture, finish and other pertinent data.
    b. If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.
2. Include application specific brochures, and installation instructions.
3. Provide Contractor's stamp of approval on samples or transmittal form as indication of Contractor's checking and verification of dimensions and coordination with interrelated work.
4. Resubmit samples of rejected items.

F. Miscellaneous Submittals
1. Identify for each item the supplier or name of company that prepared or provided the document
2. Refer to Submittal Contents section above for additional detail.

G. Operation and Maintenance Manuals
1. Number transmittals for Operation and Maintenance Manuals with original root number of the approved Shop Drawing for the item.
2. Submit Operation and Maintenance Manuals printed on 8-1/2 x 11 IN size heavy first quality paper with standard three-hole punching and bound in stiff metal hinged binder constructed as a three-ring style.
    a. Provide binders with titles on front and on spine of binder.
    b. Tab each section of manuals for easy reference with plastic-coated dividers.
    c. Provide index for each manual.
    d. Provide plastic sheet lifters prior to first page and following last page.
3. Reduce drawings or diagrams bound in manuals to an 8-1/2 x 11 IN or 11 x 17 IN size.

        - a. However, where reduction is not practical to ensure readability, fold larger drawings separately and place in vinyl envelopes which are bound into the binder.
        - b. Identify vinyl envelopes with drawing numbers.
    - 4. Submittal contents:
        - a. Submission of Operation and Maintenance Manuals is applicable but not necessarily limited to:
            - 1) Major equipment.
            - 2) Equipment used with electrical motor loads of 1/6 HP nameplate or greater.
            - 3) Specialized equipment including valves and instrumentation and control system components for HVAC and process systems such as meters, recorders, and transmitters.
            - 4) Valves greater than 12 IN DIA.
            - 5) Water control gates.
        - b. Operation and maintenance manuals shall include, but not necessarily be limited to, the following detailed information, as applicable:
            - 1) Equipment function, normal operating characteristics, limiting operations.
            - 2) Assembly, disassembly, installation, alignment, adjustment, and checking instructions.
            - 3) Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
            - 4) Lubrication and maintenance instructions.
            - 5) Guide to "troubleshooting."
            - 6) Parts list and predicted life of parts subject to wear.
            - 7) Outline, cross-section, and assembly drawings; engineering data; and electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, word description of wiring diagrams and interconnection diagrams.
            - 8) Test data and performance curves.
            - 9) A list of recommended spare parts with a price list and a list of spare parts provided under these Specifications.
            - 10) Copies of installation instructions, parts lists or other documents packed with equipment when delivered.
            - 11) Instrumentation or tag numbers relating the equipment back to the Contract Documents.
            - 12) Include a filled-out copy of the Equipment Record Sheet, Exhibits C1 and C2 as the first page(s) of each Operation and Maintenance Manual.
                - a) Complete maintenance requirements in detail. Simple reference to the Manual is not acceptable.
            - 13) For equipment items involving components or subunits, an Equipment Record Sheet for each operating component or subunit is required.

1.6 ENGINEER'S REVIEW ACTION

- A. Shop Drawings and Samples:
    - 1. Items within submittals will be reviewed for overall design intent and will receive one of the following actions:
        - a. A - FURNISH AS SUBMITTED.
        - b. B - FURNISH AS NOTED.
        - c. C - REVISE AND RESUBMIT.
        - d. D - REJECTED.
        - e. E - ENGINEER'S REVIEW NOT REQUIRED.
    - 2. Submittals received will be initially reviewed to ascertain inclusion of Contractor's approval stamp.
        - a. Drawings not stamped by the Contractor or stamped with a stamp containing language other than that specified in the Contract Documents, will not be reviewed for technical content and will be returned without any action.
    - 3. Submittals returned with Action "A" or "B" are considered ready for fabrication and installation.

        a. If for any reason a submittal that has an "A" or "B" Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal.
        b. Destroy or conspicuously mark "SUPERSEDED" all documents having previously received "A" or "B" Action that are superseded by a resubmittal.
    4. Submittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:
        a. The portion of the submittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference).
            1) One copy or the one transparency of the "C" or "D" drawings will be marked up and returned to the Contractor.
            2) Correct and resubmit items so marked.
        b. Items marked "A" or "B" will be fully distributed.
        c. If a portion of the items or system proposed is acceptable, however, the major part of the individual drawings or documents is incomplete or requires revision, the entire submittal may be given "C" or "D" Action.
            1) This is at the sole discretion of the Engineer.
            2) In this case, some drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package."
            3) Distribution to the Owner and field will not be made (unless previously agreed to otherwise).
    5. Failure to include any specific information specified under the submittal paragraphs of the Specifications will result in the submittal being returned to the Contractor with "C" or "D" Action.
    6. Transmittals of submittals which the Engineer considers as "Not Required" submittal information, which is supplemental to but not essential to prior submitted information, or items of information in a transmittal which have been reviewed and received "A" or "B" Action in a prior submittal, will be returned with Action "E. Engineer's Review Not Required."
    7. Samples may be retained for comparison purposes.
        a. Remove samples when directed. Include in bid all costs of furnishing and removing samples.
    8. Approved samples submitted or constructed, constitute criteria for judging completed work.
        a. Finished work or items not equal to samples will be rejected.

B. Miscellaneous Submittals:
    1. Items within transmittals will be reviewed for overall design intent and will receive one of the following actions:
        a. A – FILE AS SUBMITTED.
        b. B – FILE AS NOTED.
        c. C – REVISE AND RESUBMIT.
        d. D – REJECTED.
        e. E – ENGINEER’S REVIEW NOT REQUIRED.
    2. Transmittals returned with Action “A” or “B” are considered acceptable. If for any reason a transmittal that has an “A” or “B” Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal. Destroy or conspicuously mark “SUPERSEDED” all documents having previously received “A” or “B” Action that are superseded by a resubmittal.
    3. Transmittals with Action “A” or “B” combined with Action “C” (Revise and Resubmit) or “D” (Rejected) will be individually analyzed giving consideration as follows:
        a. The portion of the items are acceptable, however, if the major part of the documents are incomplete or require revision, the entire submittal may be given “C” or “D” Action. This is at the sole discretion of the Engineer. In this case, some submittals may contain relatively few or no comments or the statement, “Resubmit to maintain complete packages.” Distribution to the Owner and field will not be made (unless previously agreed to otherwise).

    b. Items marked "A" or "B" will be fully distributed.
    c. If a portion of the items or system proposed is acceptable, however, the major part of the individual drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" Action. This is at the sole discretion of the Engineer. In this case, some drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package." Distribution to the Owner and field will not be made (unless previously agreed to otherwise).
4. Failure to include any specific information specified under the submittal paragraphs of the specifications will result in the transmittal being returned to the Contractor with “C” or “D” Action.
5. All costs, associated with the review of any Miscellaneous Submittals resubmitted more than twice shall be borne by the Contractor with said costs being deducted from any payments due to the Contractor.
6. Acceptable submittals will be retained with the transmittal form returned.

C. Operation and Maintenance Manuals:
1. Engineer will review and indicate one of the following review actions:
    a. ACCEPTABLE.
    b. FURNISH AS NOTED.
    c. REVISE AND RESUBMIT.
    d. REJECTED.
2. Acceptable submittals will be retained and the transmittal form returned with a request for a specified number of additional copies.
3. Deficient submittals will be returned along with the transmittal form which will be marked to indicate deficient areas.

D. Deficient submittals will be returned along with the transmittal form which will be marked to indicate deficient areas.

END OF SECTION

SPSA

☐ **Shop Drawing** ☐ **Miscellaneous** ☐ **O & M Manual**

Submittal No. ______________ - __________ - ________

(Spec Section) (Submittal No.) (Rev No.)

Project Name:

Project Owner:

Contractor: Address: Attn:	Engineer: **HDR Engineering, Inc.** Address: **128 S. Tryon St., Suite 1400** **Charlotte, NC 28202-5004** Attn:

CONTRACTOR'S SECTION

Number of Copies	Description	Supplier / Manufacturer	Engineer's Action Taken*

Contractor's Comments:

Name Date

ENGINEER'S SECTION

Date Received

*The Action Designated Above is in Accordance with the Following Legend:

Action:

A Furnish as Submitted
B Furnish as Noted
C Revise and Resubmit
D Rejected
E Engineer's review not required.

Comments:

Shop Drawings

1 See comments.
2 Not enough information for review.
3 Copies illegible.
4 Not enough copies submitted.
5 Wrong Specification Section Number.

Misc

6 Submittal not required.
7 Supplemental Information; submittal retained for informational purposes only.
8 Information reviewed and approved on prior submittal.

O&M

9 Organizational (index & tabbing).
10 Parts List & Ordering Instructions.
11 Operating Instructions.
12 Lubrication & Maintenance Instructions.
13 Troubleshooting Guide.
14 Test data & performance curves.

Engineer's Comments:

Name Date

Distribution:

☐ Owner ☐ Contractor ☐ Engineer ☐ Field ☐ Other

HDR

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SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. General quality control.

B. Workmanship.

C. Manufacturer's instructions.

D. Manufacturer's certificates.

E. Manufacturer's field services.

1.2 RELATED REQUIREMENTS

A. Section 01340 - Submittals.

B. Construction Quality Assurance (CQA) Plan.

1.3 QUALITY CONTROL, GENERAL

A. The Contractor will maintain construction quality control (CQC) over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. The Owner shall conduct 100 percent of the CQA testing necessary for completion of the Work and incur all costs associated with CQA except as noted herein or within the CQA/CQC Plan.

1.4 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURER'S INSTRUCTIONS

Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.6 MANUFACTURER'S CERTIFICATES

When required by individual specification section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.7 MANUFACTURER'S FIELD SERVICE

A. When specified in respective specification sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

B. Representative shall submit written report to Engineer listing observations and recommendations.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

Contractor provided independent testing laboratory services; Contractor responsibilities; laboratory responsibilities; and laboratory limits of authority.

1.2 RELATED SECTIONS

A. Division 1 – General Requirements.

B. Divisions 2 through 15 Sections requiring testing services apply to the work of this Section.

1.3 REFERENCES

A. American Council of Independent Laboratories, Inc. (ACIL):
  1. Recommended requirements for independent laboratory qualifications.

B. American Society for Testing and Materials (ASTM):
  1. D3740 - Practice for Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
  2. E329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. National Bureau of Standards (NBS).

D. Geosynthetic Accreditation Institute Laboratory Accreditation Program (GAI-LAP).

E. AASHTO Accreditation Program.

1.4 GENERAL

A. Required inspection and testing services are to assist in determination of quality and quantity of materials proposed to be used in the Work. Required services do not relieve the Contractor of its responsibility for compliance with requirements of the Contract Documents.

B. Required services are not intended to limit the Contractor's own quality control procedures, but to establish the minimum testing level necessary to monitor compliance of construction materials and methods with Contract requirements.

C. Contractor shall retain independent testing laboratory to perform tests, and related actions as required by these Contract Documents. This may be the same party as the CQC Consultant, or a subcontractor to the CQC Consultant.

1.5 SUBMITTALS

A. Submit 3 copies of the following information within 14 calendar days of the Notice to Proceed:
  1. Independent Testing Laboratory:
    a. Name, address, and telephone number.
    b. Name of full-time Registered Engineer(s), if applicable.
    c. Name of responsible officer(s).
    d. Copy of facilities inspection report made by Materials Reference Laboratory of NBS during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.
    e. Copy of calibration results for testing equipment to be used or certification that testing equipment has been calibrated to NBS.

2. Schedule of inspections, tests, and similar services presented in tabular form:
    a. Reference to Specification Section and unit of work.
    b. Description of test.
    c. Identification of applicable standards and test methods.
    d. Number of test(s) required.
    e. Time schedule or time span for tests.
    f. Entity responsible for performing tests.
    g. Requirements for taking samples.
    h. Unique characteristics of each service.

B. Submit 3 copies of the following information within 14 calendar days of the completion of each service:
  1. Written report of each inspection, test, or similar service:
    a. Date issued.
    b. Independent laboratory name, address, and telephone number.
    c. Project Name and Project Number.
    d. Dates, times, and locations of samples and tests or inspections.
    e. Record of temperature and weather conditions.
    f. Names and signatures of individuals making the test or inspection.
    g. Designation of the work or product in relation to Specification Section.
    h. Complete inspection or test data.
    i. Type of test or inspection method.
    j. Results of test and compliance with the Contract Documents.
    k. Interpretation of test results,
    l. Recommendations on retesting, if applicable,

1.6 QUALIFICATIONS OF INDEPENDENT LABORATORY

A. Holds a current GAI-LAP accreditation for each specified geosynthetic test for which GAI-LAP offers accreditation..

B. Meets requirements of ASTM D3740 and ASTM E329, if performing such services.

C. Authorized to operate in the State of Virginia with qualified and licensed full-time Registered Engineer, if applicable.

D. Testing equipment calibrated at reasonable intervals with devices of an accuracy traceable to either NBS or accepted values of natural physical constants.

E. Acceptable to the CQA Consultant. CQA Consultant will have the right to disapprove of independent laboratory or agency which does not meet the criteria of this Section.

1.7 INDEPENDENT LABORATORY RESPONSIBILITIES

A. Test samples of materials submitted by Contractor.

B. Provide qualified personnel at site after due notice; cooperate with Engineer and Contractor in performance of services.

C. Perform specified sampling, and testing of products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Notify Engineer and Contractor immediately of observed irregularities or non-conformance of work or products.

1.8 LIMITATIONS OF AUTHORITY OF INDEPENDENT LABORATORY

A. Independent laboratory is not authorized to:
  1. Release, revoke, alter, or enlarge on requirements of the Contract Documents.
  2. Approve or accept any portion of the Work, except where noted within the Contract Documents.

3. Assume or perform any duties of the Contractor.
4. Stop work.

1.9 CONTRACTOR'S RESPONSIBILITIES

A. Inspections, tests, and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent laboratory and not directly by the Contractor.

B. Employ and pay an independent laboratory or other qualified agency to perform quality control services specified.

C. Cooperate with the independent laboratory(ies) performing required inspections, tests, and similar services. Notify the independent laboratory no less than 24 hours in advance of operations to permit assignment of personnel and scheduling of tests.

D. Provide such auxiliary services as are requested. These auxiliary services include, but are not limited to:
   1. Providing access to the work.
   2. Taking samples or assistance with taking samples.
   3. Delivery of samples to test laboratories.
   4. Security and protection of samples and test equipment at the Project site.

E. Contractor and each independent laboratory shall coordinate the sequence of their activities to minimize delay in progress of the Work.

F. Contractor and each independent laboratory shall coordinate their work to avoid removing or replacing work to accommodate inspections and tests. Contractor shall be responsible for scheduling times for inspections, tests, taking of samples, and similar activities.

G. Inspections and tests required by codes or ordinances, or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor.

1.10 RETEST RESPONSIBILITIES AND CONVENIENCE TESTING

A. Where results of inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with requirements of the Contract Documents, repeats of the inspections, tests, or similar services shall be conducted following revision or replacement of the affected work.

B. Cost of repeat inspections, tests, or similar services shall be the Contractor's responsibility, regardless of responsibility of original inspection, test, or similar service.

C. Inspections, tests, or similar services performed exclusively for the Contractor's convenience and the costs of same shall be the sole responsibility of the Contractor.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Sanitary facilities.

B. Barriers.

C. Electricity and lighting.

D. Historical protection.

E. Noise protection.

F. Protection of installed work.

G. Cleaning during construction.

H. Removal.

I. Safety and security provisions.

1.2 SANITARY FACILITIES

A. Provide and maintain facilities and enclosures as required. Existing SPSA facilities shall be off-limits to Contractor’s employees.

1.3 BARRIERS

A. Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Restore all disturbed areas to original condition unless otherwise noted.

1.4 HISTORICAL PROTECTION

A. If during the course of construction evidence of deposits of historical or archaeological interests are found, cease work affection find and notify the Owner. Do not disturb deposits until written notice from Owner is given to proceed. Lost time or changes in construction to avoid the find shall be compensated for based upon normal change order procedures.

1.5 NOISE PROTECTION

A. Minimize noise by fitting equipment with appropriate mufflers or sound enclosures. The use of explosives or blasting operations is not approved.

1.6 PROTECTION OF INSTALLED WORK

A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

B. Prohibit traffic and storage on waterproofed, lawn, and landscaped areas.

C. Immediately report any damage to structures to CQA Consultant and Owner.

1.7 DUST CONTROL

A. Methods for controlling dust are to conform to Virginia Department of Transportation Road and Bridge Specifications Section 513.

B. All costs associated with the provisions of dust control shall be included in the Contractor's Firm Base Bid Price. No additional payment shall be made to the Contractor for any work, materials, labor, equipment, and/or services necessary for or incidental to the provision of required dust control measures.

1.8 EROSION AND SEDIMENT CONTROL

A. Employ and utilize environmental protection methods in full observance of all state, federal, and local regulations.

B. Refer to the following standards and include as part of these specifications:

1. Virginia Erosion and Sediment Control Handbook Third Edition, 1992, or latest updates.
2. Virginia Department of Transportation Road and Bridge Specifications, January 1991, or latest updates.
3. “Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas” by the U.S. Department of Agriculture, Soil Conversation Service, College Park, Maryland.

C. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas to prevent erosion and sedimentation.

D. Provide temporary measures such as berms, dikes, and drains to prevent water flow and protect terrain in accordance with control measures shown on Drawings and following:

1. Protect properties adjacent to the project site from sediment deposition by installing appropriate perimeter controls.
2. Sediment barriers and other measures intended to trap sediment on-site shall be constructed as the first step in site preparation operations and shall be made functional before any upslope disturbance takes place.
3. Restore all disturbed areas to original condition unless otherwise noted or directed by Owner.
4. Protect all side slopes and back slopes immediately upon completion of final grading.
5. Plan and execute earthwork in a manner to minimize duration of exposure of unprotected soils.

E. Runoff Protection: Utilize methods in compliance with Virginia Erosion and Sediment Control Handbook (VESCH) Standards to effectively prevent erosion and control of sedimentation. Control methods shall include, but not necessarily be limited to, the following:

1. Retardation. Mechanically retard rate of runoff by construction of diversion ditches, terraces, and berms. Divert runoff to prevent damage to water courses.
2. Protect side and backslopes as soon as rough grading is complete.
3. Provide stabilization adequate to prevent erosion at the outlets of all drainage pipes and ditches from the site.

F. Stormwater Run-on Control: Contractor shall take all appropriate actions to avoid and prevent any stormwater from entering portions of any constructed areas by providing appropriate diversions. These measures/actions shall include, but not be limited to, berms, swales, barriers, and/or culverts.

G. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures at no additional cost to Owner.

1.9 CLEANUP DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of off-site at an approved disposal site. On-site disposal areas may be provided at the discretion of the Owner.

1.10 REMOVAL

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2 feet: grade site as indicated. Restore existing facilities used during construction to specified, or to original condition.

1.11 SAFETY AND FIRE PREVENTION PROGRAMS/PROVISIONS

A. Contractor shall take all reasonable precautions to preserve and protect the Owner's and other Contractors' property and employees during the construction period. Contractors shall develop and maintain safety and fire prevention and loss control programs appropriate for their activities throughout the construction period.

B. Contractor shall be responsible for all site safety within the limits of the Work and shall strictly abide by all Federal, state, and local laws, regulations, and ordinances, including but not limited to those applicable requirements administered by the Occupational Safety and Health Administration (OSHA).

C. Contractor shall be responsible to adequately secure the site at the end of each workday.

1.12 UTILITIES

A. Contractor is to provide water, sewer, electrical, telephone, or other services as required for the project. The Contractor is responsible for all fees associated with their usage of said services.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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SECTION 01610

PRODUCT DELIVERY, STORAGE, AND HANDLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Scheduling of product delivery.
   2. Packaging of products for delivery.
   3. Protection of products against damage from:
      a. Handling.
      b. Exposure to elements or harsh environments.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Divisions 2 through 15 requiring product delivery, storage, and handling.

C. Payment:
   1. No payment will be made to Contractor for equipment or materials not properly stored and insured.
   2. Previous payments for items will be deducted from subsequent progress estimate(s) if proper storage procedures are not observed.
   3. No payment will be made to Contractor for equipment or materials that do not have an approved shop drawing.

1.2 QUALITY ASSURANCE

A. Manufacturer's written directions.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Scheduling:
   1. Schedule delivery of products or equipment as required to allow timely installation and to avoid prolonged storage.

B. Packaging:
   1. Deliver products or equipment in manufacturer's original unbroken cartons or other containers, clearly and fully marked and identified as to manufacturer, item, installation location and instructions for assembly, use and storage.

C. Protection:
   1. Protect all materials in accordance with manufacturer's written directions.
      a. Store products or equipment in location to avoid physical damage to items while in storage.
      b. Handle products or equipment in accordance with manufacturer's recommendations and instructions.
   2. Protect equipment from exposure to elements and keep thoroughly dry.
   3. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Repaint damaged painted surfaces to satisfaction of Engineer.
   4. Protect electrical equipment, controls and insulation against moisture or water damage.

3.2 STORAGE FACILITIES

A. Contractor to provide temporary equipment storage as needed.

3.3 FIELD QUALITY CONTROL

A. Inspect all products or equipment delivered to the site prior to unloading and reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on Project.

B. Continually monitor storage area to ensure suitable temperature and moisture controls are maintained.

END OF SECTION

SECTION 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General.
  1. Furnishing of all labor, materials, tools, equipment, and perform all work and services for furnishing, submission, processing and handling of requests for substitutions for items on drawings or in specifications. Any substitution or option shall be in accord with provisions of Contract Documents, and completely coordinated with work of other trades. For Products, Equipment and Materials which are named in drawings or specifications for which a request for substitution is made observe procedures outlined in these specifications.
  2. Cost incurred by requester in providing information, catalogs and samples - including but not limited to labor, materials, freight postage, and transportation - are sole cost of "Requester" with no cost assessed Owner or Engineer.
  3. Although such work is not specifically indicated, furnish all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.2 REQUIREMENTS INCLUDED

A. Contractor's options in selection of products.

B. Products list.

C. Requests for substitution of products.

1.3 RELATED REQUIREMENTS

A. Section 01340 - Submittals.

1.4 ADDRESS FOR SUBMISSION OF REQUEST

HDR Engineering, Inc.
3733 National Drive
Suite 207
Raleigh, NC 27612
ATTN: Douglas T. DeCesare, PE
RE: Section 01630 Request for Substitution
Project: SPSA Regional Landfill – Cell VII Expansion

1.5 REQUESTS FOR SUBSTITUTION: GENERAL

A. Provide base bids to include materials, equipment and procedures specified. Certain types of equipment and kinds of materials are described in specifications by means of trade names and catalog numbers and manufacturer's names. Where this occurs it is not intended to exclude from consideration such types of equipment and kinds of material bearing other trade names, catalog numbers and manufacturer's names, capable of accomplishing the same purpose as types of equipment or kinds of material specifically indicated. Other types of equipment and kinds of material may be acceptable to Owner and may be submitted for consideration under Paragraph 1.6 of this specification.

1.6 SUBSTITUTION DURING BIDDING PERIOD

A. During bidding period, Engineer will consider written requests for substitutions of products, materials, equipment systems or other items. Requests must be received by Engineer by the date specified in the General Conditions. Requests received after that time will not be considered and will be held on "No-Action" or "No-Response" basis.

B. Substitute items must comply with color and pattern of base specified items unless specifically approved otherwise.

C. Submit request for substitution to include but not necessarily be limited to:
  1. Name of product located by Drawing No. or Specification No. followed by detail or line number the particular item(s) for which request for substitution is initiated.
  2. Complete data substantiating compliance of proposed substitution with Contract Documents and statement that requested substitution equals or exceeds item(s) specified.
  3. For products and equipment:
     a. Product or Equipment identification by schedule or tag no. including manufacturer's name.
     b. Manufacturer's literature, marked to indicate by arrows specific model, type and size to be considered.
        1) Product or equipment description.
        2) Performance and test data.
        3) Reference standards.
     c. Submit samples, full size if requested by Engineer and insure Owner or Engineer to impound sample until physical units are installed on project for comparison purposes.
     d. Name and address of similar projects on which product was used, date of installation, and field performance data on installation.
  4. For construction methods:
     a. Detailed description of proposed method.
     b. Drawings illustrating methods.
  5. Itemized comparison of proposed substitution with product or method specified.
  6. Data relating to changes in construction schedule.

D. In making request for substitution, or in using an approved substitute item, the requester represents that he:
  1. Has personally investigated proposed product, equipment, or method, and has determined that it is equal or superior in all respects to that specified, and that it will adequately perform function for which it is intended.
  2. Will provide same or better warranty for substitute item as for product or method specified.
  3. Will coordinate installation of accepted substitution into work to include, but not necessarily limited to:
     a. Building and structure modifications as necessary,
     b. Additional ancillary equipment to accommodate change,
     c. Piping, valving, mechanical, electrical, or instrumentation changes, and
     d. All other changes required for work to be complete in all respects to permit incorporation of substitution into project.
  4. Waives claims for additional costs related to substitution which subsequently become apparent.

E. Approved substitutions will be listed and published by Addenda only.

1.7 SUBSTITUTION AFTER BID DATE

A. Unavailability of specified item due to strikes, lockouts, bankruptcy, discontinuance of production, proven shortage, or similar occurrences are only reasons for substitution after bid date.

B. Notify Engineer in writing, as soon as condition of unavailability becomes apparent; include substantiating data. Submit request for substitution sufficiently in advance to avoid delays.

C. Submit data as required in Paragraph 1.6 above.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01650

SYSTEM STARTUP

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures and actions, required of the Contractor, which are necessary to achieve and demonstrate Substantial Completion.
   2. Requirements for Substantial Completion Submittals.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Section 11005 - Equipment: Basic Requirements.

C. Systems Requiring Start-up.
   1. Pumps and controls.
   2. Force main.
   3. Instrumentation (i.e., flow meters, PLC’s, lighting, automatic valves, recorders, etc.).

1.2 DEFINITIONS

A. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction and installation activities during which Contractor, with assistance from manufacturer's representatives, performs in the following sequence:
   1. Finishing type construction work to ensure the Project has reached a state of Substantial Completion.
   2. Equipment startup.
   3. Personnel training.

B. Demonstration Period: A period of time, of specified duration, following the Pre-Demonstration Period, during which the Contractor initiates product through the system and starts up and operates the system, to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the system as evidence of Substantial Completion.

C. Substantial Completion: See Division 0, General Conditions.

1.3 SUBMITTALS

A. Submit in the chronological order listed below prior to the completion of the Pre-Demonstration Period.
   1. Master operation and maintenance training schedule:
      a. Attend a schedule planning and coordination meeting 45 calendar days prior to first anticipated training session.
         1) Provide a status report and schedule-to-complete for requirements prerequisite to manufacturer's training.
         2) Identify initial target dates for individual manufacturer's training sessions.
      b. Submit 30 days (minimum) prior to first training session for Owner's personnel.
      c. Schedule to include:
         1) Target date and time for Owner witnessing of each system initial startup.
         2) Target date and time for Operation and Maintenance training for each system, both field and classroom.
         3) Target date for initiation of Demonstration Period.
      d. Submit for review and approval by Owner.
      e. Include holidays observed by Owner.

    - f. Owner reserves the right to insist on a minimum 7 days' notice of rescheduled training session not conducted on master schedule target date for any reason.
    - g. Schedule to be resubmitted until approved.
  - 2. Substantial Completion Submittal:
    - a. File Contractor's Notice of Substantial Completion and Request for Inspection.
    - b. Approved Operation and Maintenance manuals received by Engineer minimum 1 week prior to scheduled training.
    - c. Written request for Owner to witness each system pre-demonstration startup. Request to be received by Owner minimum 1 week before scheduled training of Owner's personnel on that system.
    - d. Equipment installation and pre-demonstration startup certifications.
    - e. Letter verifying completion of all pre-demonstration startup activities including receipt of all specified items from manufacturers or suppliers as final item prior to initiation of Demonstration Period.

1.4 COST OF STARTUP

- A. Contractor to pay all costs associated with System startup.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL

- A. Facility Startup Divided into Two Periods:
  - 1. Pre-Demonstration Period including:
    - a. Completion of construction work to bring Project to a state of Substantial Completion.
    - b. Startup of Equipment.
    - c. Training of Personnel.
    - d. Completion of the filing of all required submittals.
    - e. Filing of Contractor's Notice of Substantial Completion and Request for Inspection.
  - 2. Demonstration Period including:
    - a. Demonstration of functional integrity of facility.

3.2 PRE-DEMONSTRATION PERIOD

- A. Completion of Construction Work:
  - 1. Complete the work to bring the Project to a state of substantial completion.

- B. Equipment Startup:
  - 1. Requirements for individual items of equipment are included in Divisions 2 through 16 of these Specifications.
  - 2. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
  - 3. Perform Equipment Startup to extent possible without introducing product flow.
  - 4. Introduce product flow to complete Equipment Startup for the following equipment:
    - a. Flow element.
    - b. Video graphic recorder.
    - c. Leachate and groundwater pumps.
  - 5. Procedures include but are not necessarily limited to the following:
    - a. Test or check and correct deficiencies of:
      - 1) Power, control, and monitoring circuits for continuity prior to connection to power source.
      - 2) Voltage of all circuits.
      - 3) Phase sequence.

        - 4) Cleanliness of connecting piping systems.
        - 5) Alignment of connected machinery.
        - 6) Vacuum and pressure of all closed systems.
        - 7) Lubrication.
        - 8) Valve orientation and position status for automatic manual operating modes.
        - 9) Pumping equipment using clean water.
        - 10) Instrumentation and control signal generation, transmission, reception, and response. See Section 13440.
        - 11) Tagging and identification systems.
        - 12) All equipment: Proper connections, alignment, calibration and adjustment.
    - b. Calibrate all safety equipment.
    - c. Manually rotate or move moving parts to assure freedom of movement.
    - d. "Bump" start electric motors to verify proper rotation.
    - e. Perform other tests, checks, and activities required to make the equipment ready for Demonstration Period.
    - f. Documentation:
        - 1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Startup. Provide a place for the Contractor to record date and person accomplishing required work. Submit completed document before requesting inspection for Substantial Completion certification.
- 6. Obtain certifications, without restrictions or qualifications, and deliver to Engineer:
    - a. Manufacturer's equipment installation check letters.
    - b. Instrumentation Supplier's Instrumentation Installation Certificate.

C. Personnel Training:

- 1. See individual equipment specification sections.
- 2. Conduct all personnel training after completion of Equipment Startup for the equipment for which training is being conducted.
    - a. Personnel training on individual equipment or systems will not be considered completed unless:
        - 1) All pretraining deliverables are received and approved before commencement of training on the individual equipment or system.
        - 2) No system malfunctions occur during training.
        - 3) All provisions of field and classroom training specifications are met.
    - b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to Owner.
- 3. Field and classroom training requirements:
    - a. Hold classroom training on-site.
    - b. Notify each manufacturer specified for on-site training that the Owner reserves the right to video record any or all training sessions. Organize each training session in a format compatible with video recording.
    - c. Training instructor: Factory trained and familiar with giving both classroom and "hands-on" instructions.
    - d. Training instructors: Be at classes on time. Session beginning and ending times to be coordinated with the Owner and indicated on the master schedule. Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.
    - e. Organize training sessions into maintenance verses operation topics and identify on schedule.
    - f. Plan for minimum class attendance of six people at each session and provide sufficient classroom materials, samples, and handouts for those in attendance.
    - g. Instructors to have a typed agenda and well prepared instructional material. The use of visual aids, e.g., films, pictures, and slides is recommended for use during the classroom training programs. Deliver agendas to the Engineer a minimum of 7 days prior to the classroom training. Provide equipment required for presentation of films, slides, and other visual aids.

        - h. In the on-site training sessions, cover the information required in the Operation and Maintenance manuals submitted according to Section 01340 and the following areas as applicable to PCS's.
            - 1) Operation of equipment.
            - 2) Lubrication of equipment.
            - 3) Maintenance and repair of equipment.
            - 4) Troubleshooting of equipment.
            - 5) Preventive maintenance procedures.
            - 6) Adjustments to equipment.
            - 7) Inventory of spare parts.
            - 8) Optimizing equipment performance.
            - 9) Capabilities.
            - 10) Operational safety.
            - 11) Emergency situation response.
            - 12) Takedown procedures (disassembly and assembly).
        - i. Address above paragraphs 1), 2), 8), 9), 10), and 11) in the operation sessions. Address above paragraphs 3), 4), 5), 6), 7), and 12) in the maintenance sessions.
        - j. Maintain a log of classroom training provided including: Instructors, topics, dates, time, and attendance.

- D. Complete the filing of all required submittals:
    - 1. Shop drawings.
    - 2. Operation and Maintenance Manuals.
    - 3. Training material.

- E. Filing of Contractor's Notice of Substantial Completion and Request for Inspection of Project:
    - 1. File the notice when the following have been completed:
        - a. Construction work (brought to state of Substantial Completion).
        - b. Equipment Startup.
        - c. Personnel Training.
        - d. Submittal of required documents.
    - 2. Engineer will review required submittals for completeness within 5 calendar days of Contractor's notice. If complete, Engineer will complete inspection of the Work, within 10 calendar days of Contractor's notice.
    - 3. Engineer will inform Contractor in writing of the status of the Work reviewed, within 14 calendar days of Contractor's notice.
        - a. Work determined not meeting state of Substantial Completion:
            - 1) Contractor: Correct deficiencies noted or submit plan of action for correction within 5 days of Engineer's determination.
            - 2) Engineer: Reinspect work within 5 days of Contractor's notice of correction of deficiencies.
            - 3) Reinspection costs incurred by Engineer will be billed to Owner who will deduct them from final payment due Contractor.
        - b. Work determined to be in state of tentative Substantial Completion: Engineer to prepare tentative "Engineer's Certificate of Substantial Completion."
        - c. Engineer's Certificate of Substantial Completion:
            - 1) Certificate tentatively issued subject to successful Demonstration of functional integrity.
            - 2) Issued for Project as a whole.
            - 3) Issued subject to completion or correction of items cited in the certificate (punch list).
            - 4) Issued with responsibilities of Owner and Contractor cited.
            - 5) Executed by Engineer.
            - 6) Accepted by Owner.
            - 7) Accepted by Contractor.

d. Upon successful completion of Demonstration Period, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of beginning the successful Demonstration Period of functional integrity as the effective date of Substantial Completion.

3.3 DEMONSTRATION PERIOD

A. General:
1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the system as evidence of Substantial Completion.
2. Duration of Demonstration Period: 120 consecutive hours.
3. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure. The new Demonstration Period shall have the same requirements and duration as the Demonstration Period previously conducted.
4. Conduct the demonstration of functional integrity under full operational conditions.
5. Owner will provide operational personnel to provide process decisions affecting landfill performance. Owner's assistance will be available only for process decisions. Contractor will perform all other functions including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period.
6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
7. Time of beginning and ending any Demonstration Period shall be agreed upon by Contractor, Owner, and Engineer in advance of initiating Demonstration Period.
8. Throughout the Demonstration Period, provide knowledgeable personnel to answer Owner's questions, provide final field instruction on all systems and to respond to any system problems or failures which may occur.
9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

END OF SECTION

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SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Description of procedures to be followed and related work required to accomplish an orderly transfer of Project deliverables from the Contractor to the Owner.

B. Related Sections include but are not necessarily limited to:
  1. Division 1 - General Requirements.

1.2 DEFINITIONS

A. Punch List: The stated qualification accompanying either the Engineer's Certificate of Substantial Completion or the Certificate of Final Payment, or any list of construction items found to be deficient or incomplete through review of the Work by Engineer and communicated in writing to Contractor at any time during the Contract Period.

B. Record Drawings: Drawings showing changes made during actual construction.

1.3 SUBMITTALS

A. Substantial Completion:
  1. Contractor to notify Engineer that the Contractor considers the Work as a whole to be in Substantial Completion and request for a Substantial Completion inspection.
  2. Installation Certification Letters.
  3. Record Drawings.
  4. Warranties as specified in Divisions 2 through 16 Specification Sections.
  5. A list of work, if any, not to be considered for Substantial Completion.
  6. Registry of training sessions conducted and list of attendees for:
     a. Specified Contractor's operation and maintenance training during Facility Startup.
  7. Refer to Section 01040 for additional information.

B. Final Completion:
  1. Contractor to notify Engineer that the Contractor considers the entire Work to have progressed to final completion.
  2. When final completion and Substantial Completion are coincidental:
     a. Submittals required for Substantial Completion, and;
     b. Record Drawings;
     c. Lien waivers, if requested by Owner;
     d. Evidence of payments, if requested by Owner.
  3. When final completion does not coincide with Substantial Completion:
     a. Substantial Completion submittals for portions of the work not previously considered substantially complete, if any, and;
     b. Record Drawings;
     c. Lien waivers, if required by Owner;
     d. Evidence of payments, if required by Owner.
  4. Refer to Section 01040 for additional information.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 SUBSTANTIAL COMPLETION, ADJUSTMENT AND RELEASE OF RETAINAGE

A. When the Work is found to be in a state of Substantial Completion with stated qualifications:
   1. Retainage may be reduced to five (5) percent;
   2. Or at Owner's sole discretion:
      a. Engineer: Determine the value of the punch list work using either the Project approved cost breakdown, schedule of values, or other method at his discretion.
      b. The value of incomplete work will be multiplied by 2 and retainage reduced to that amount.

B. No partial payments of the Substantial Completion retainage will be allowed.

C. The Substantial Completion retainage will be released with final payment.

3.2 DELIVERY OF EXTRA MATERIALS AND SPARE PARTS

A. Provide security, protection from the elements and maintenance, such as rotation of bearing supported shafts, for the entire Contract Period.

B. No deliveries of partial inventories accepted.

C. Upon Substantial Completion, Engineer will notify Contractor in writing that extra materials and spare parts may be delivered.
   1. Deliver to Owner through Engineer unless otherwise directed in writing.
   2. Contractor and representatives of Owner and Engineer shall inspect and inventory all items delivered.
   3. Inventory shall be revised to indicate any items delivered that were damaged or defective.
   4. Contractor and Owner's and Engineer's representatives shall sign inventory certifying that all items listed were delivered and that, unless otherwise noted on the inventory, all items were in good condition at the time of delivery to Owner.

D. Engineer will review inventory for completeness and inform Contractor promptly of any deficiencies therein.

E. Contractor shall replace all damaged and defective items noted on the inventory before requesting final inspection.

3.3 INSPECTION FOR FINAL ACCEPTANCE AND PAYMENT

A. When the items of Work on the Punch List(s) have been completed, and Contractor considers the Work of the entire Project is complete, he shall submit written certification that:
   1. Contract Documents have been reviewed.
   2. Work has been inspected for compliance with Contract Documents.
   3. Work has been completed in accordance with Contract Documents.
   4. Equipment and systems have been tested in the presence of Owner's representative and are operational.
   5. Work has received final cleanup and restoration.
   6. Work is completed and ready for final inspection.

B. Engineer and Owner will make an inspection with the Contractor to verify the status of completion within 14 calendar days after receipt of such certification.

C. Should Engineer consider that the Work is incomplete or defective:
   1. Engineer: Notify the Contractor in writing within 7 calendar days, listing the incomplete or defective work.

2. Contractor: Remedy the stated deficiencies, and send a second written certification to Engineer that the Work is complete.
3. Engineer will reinspect the Work.

D. When Engineer finds the Work acceptable in accordance with the Contract Documents: Engineer requests Contractor to make closeout submittals.

E. Reinspection costs incurred by the Engineer will be billed to the Owner and deducted by the Owner from the final payment to the Contractor.

3.4 FINAL APPLICATION FOR PAYMENT

A. Complete demobilization prior to submitting final application for payment.

B. Submit final application for payment in accordance with procedures and requirements stated in the Conditions of the Contract.

C. Engineer will review application for final payment within 7 calendar days of receipt of application, and provide a recommendation to the Owner regarding payment.

END OF SECTION

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SECTION 02220

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Earthwork.

B. Related Sections include but are not necessarily limited to:
  1. Division 0 - Bid Requirements, Contract Forms, and Conditions of the Contract.
  2. Division 1 - General Requirements.
  3. Section 02221 – Trenching, Backfilling, and Compacting.
  4. Construction Quality Assurance/Quality Control Plan.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
  1. American Society for Testing and Materials (ASTM):
    a. C33, Standard Specification for Concrete Aggregates.
    b. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3).
    c. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/f (2,700 kN-m/m)).
    d. D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.
    e. D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
    f. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
    g. D4254, Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.
  2. Virginia Erosion and Sediment Control Planning and Design Manual, current edition.
  3. Virginia Department of Transportation Standard Specification for Roads and Structures, current edition.

B. Contractor to employ an independent soils laboratory (CQC Consultant) to conduct the specified tests to assure that all work complies with this Specification.

1.3 SUBMITTALS

A. Shop Drawings:
  1. See Section 01340.
  2. Product technical data including:
    a. Acknowledgement that products submitted meet requirements of standards referenced.
    b. Manufacturer's installation instructions.
  3. Certifications.
  4. Test reports:
    a. Soils inspection and testing results.

B. Samples:
  1. Submit samples and source of fill and backfill materials proposed for use.
  2. Submit samples and source of borrow materials proposed for use.
  3. Submit soil samples directly to CQA Consultant with notification to the Engineer.

1.4 SOILS/GEOTECHNICAL

A. The Owner will provide for the on-site services of a CQA Consultant (Soils Engineer) to selectively test materials and monitor compliance with the requirements of these Specifications.

B. The Contractor will afford these representatives access to the job site for the performance of their duties as described in the Contract Documents.

C. General Duties and Responsibilities of the Owner's CQA Consultant: Under the direction of a qualified registered engineer or geologist:
  1. Perform stockpile and in-place testing of all soil and rock materials used in the work in conformance with these Specifications and the CQA Plan.
  2. Inspect subgrades and excavations and evaluate/determine suitability of materials encountered. Determine extent of any overexcavation required to remove unsuitable materials under roadways, structures, or other areas of construction.
  3. Document placement of fill materials and perform testing to confirm compliance with these Specifications.
  4. Evaluate the suitability of existing on-site materials for use in construction of embankments and fills.
  5. Measure quantity of unsuitable materials under contract provisions for authorized overexcavation and backfill.
  6. Review construction operations and monitor for compliance with Contract Documents.

D. Available Subsurface Information: Where provided, data on subsurface soil conditions are not intended as representations or warranties of the continuity of such conditions between borings or indicated sampling locations. It shall be expressly understood that neither the Owner nor the Engineer will be responsible for any interpretation or conclusion drawn therefrom by the Contractor. Data is made available for the convenience of the Contractor.

E. Additional or supplementary soil borings or other exploratory operations may be made by the Contractor at no additional cost to the Owner. The Contractor shall provide the Owner with a copy of any data obtained/developed during such work. Such additional work shall be performed in a timely manner in accordance with and not impacting or changing the project schedule set forth in the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill and Backfill: Selected material approved by Soils Engineer and Owner from on-site borrow sources.

B. Structural Fill: Structural fill should conform to the following:

SIEVE SIZE	PERCENT FINER BY WEIGHT
3 IN	100
¼ IN	30-70
No. 40	5-40
No. 200	0-10

C. The Contractor shall conduct his own quantity and quality investigations and testing to determine availability and suitability of (on-site) borrow materials, as allowed by the Owner.

D. All earth materials proposed for use in the Work shall be adequately characterized prior to the Work by the CQC Consultant.

E. Where required, select borrow material shall conform to select material Type II, VDOT road and bridge specifications, Section 207.02. Material shall be approved by the CQA Consultant and shall be obtained from an off-site source secured by the contractor.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect existing surface and subsurface features on-site and adjacent to site as follows:
   1. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing items indicated to remain in place.
   2. Protect and maintain benchmarks, monitoring wells, existing structures, monuments, or other established reference points and property corners. If disturbed or destroyed, replace at own expense to full satisfaction of Owner and controlling agency.
   3. Verify location of utilities. Omission or inclusion of utility items does not constitute non-existence or definite location. Secure and examine local utility records for location data.
      a. Take necessary precautions to protect existing utilities from damage due to any construction activity.
      b. Repair damages to utility items at own expense.
      c. In case of damage, notify Engineer at once so required protective measures may be taken.
   4. Maintain free of damage, existing sidewalks, structures, and pavement not indicated to be removed. Any item known or unknown or not properly located that is inadvertently damaged shall be repaired to original condition. All repairs to be made and paid for by Contractor.
   5. Provide full access to public and private premises, fire hydrants, street crossings, sidewalks, and other points as designated by Owner to prevent serious interruption of travel.
   6. Maintain stockpiles and excavations in such a manner to prevent inconvenience or damage to structures on-site or on adjoining property.
   7. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.
   8. Conduct operation with minimum interference to daily landfill operations.

B. Construct erosion and sedimentation controls prior to beginning earthwork.

C. Salvageable Items: Carefully remove items to be salvaged, and store on Owner's premises unless otherwise directed.

D. Dispose of waste materials, legally, off site. Burning, as a means of waste disposal, is not permitted.

3.2 SITE EXCAVATION AND GRADING

A. The Work includes all operations in connection with excavation, borrow, construction of fills and embankments, rough grading, and disposal of excess materials in connection with the preparation of the site(s) for construction of the proposed facilities.

B. Excavation and Grading: Perform as required by the Contract Drawings.
   1. Contract Drawings may indicate both existing grade and finished grade required for construction of Project. Stake all units, structures, piping, roads, parking areas and walks and establish their elevations. Perform other layout work required. Replace property corner markers to original location if disturbed or destroyed.
   2. Preparation of ground surface for embankments or fills: Before fill is started, scarify to a minimum depth of 6 IN in all proposed embankment and fill areas. Where ground surface is steeper than one vertical to four horizontal, plow surface in a manner to bench and break up surface so that fill material will bind with existing surface.

3. Protection of finish grade: During construction, shape and drain embankment and excavations. Maintain ditches and drains to provide drainage at all times. Protect graded areas against action of elements prior to acceptance of work. Re-establish grade where settlement or erosion occurs.

C. Borrow: Provide necessary amount of approved fill compacted to density equal to that indicated in this Specification. Include cost of all borrow material in original Bid. Fill material to be approved by Soils Engineer prior to placement.

D. Construct embankments and fills as required by the Contract Drawings:
1. Construct embankments and fills at locations and to lines of grade indicated. Completed fill shall correspond to shape of typical cross section or contour indicated regardless of method used to show shape, size, and extent of line and grade of completed work.
2. Provide approved fill material which is free from roots, organic matter, trash, frozen material, and stones having maximum dimension greater than 6 IN. Ensure that stones larger than 4 IN are not placed in upper 6 IN of fill or embankment. Do not place material in layers greater than 12 IN loose thickness. Place layers horizontally and compact each layer prior to placing additional fill.
3. Compact by sheepsfoot, pneumatic rollers, vibrators, or by other equipment as required to obtain specified density. Control moisture for each layer necessary to meet requirements of compaction.

E. Upon reaching subgrade elevations shown, proofroll subgrade soils and obtain the CQA Consultant’s review/recommendation and approval. If unsuitable materials are encountered at the subgrade elevation, repair as directed by the CQA Consultant and approved by the CQA Consultant to remove unsuitable materials. Excavation of 1 CY or greater should be preapproved by the CQA Consultant.

F. Proofrolling shall be conducted with a pneumatic-tired vehicle of at least 20 tons Gross Vehicle Weight (GVW), approved by the CQA Consultant. An alternate approved by the CQA Consultant may be used in constricted areas. For soils excavated below the groundwater table a different procedure may be utilized as approved by the CQA Consultant such as the testing subgrade soils for in-place densities combined with observing the reaction of the soils when rolled with a 10-ton vibratory smooth drum loader.

G. Where subgrade materials are determined to be unsuitable, such materials shall be removed to the lengths, widths, and depths directed by the CQA Consultant, and backfilled with suitable material unless further excavation or earthwork is required. No additional payment will be made for such excavation and backfill 6 IN or less than the finished subgrade. Payment for unsuitable material excavation greater than 6 IN beneath the finished subgrade shall be negotiated.

H. The subgrade of areas to receive fill shall be smooth and free of all vegetation, sticks, roots, rocks, and debris.

I. Dewatering (as required): Provide and maintain dewatering of all surface water and/or groundwater as required for excavation. Where groundwater is or is expected to be encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade below foundations and fill material, to allow foundations, fill material, and structures/backfill to be placed in the dry, and maintain a stable excavation. Soils and hydrogeologic information may be reviewed before beginning excavation to determine where goundwater is likely to be encountered during excavation. Employ a dewatering specialist for selecting/designing, monitoring, and operating the dewatering system as needed. Keep dewatering system in operation until dead load of structure exceeds possible buoyant uplift force on structure or fill material. Dispose of groundwater to an area which will not interfere with construction operations or damage existing construction as approved by the Owner. Install groundwater monitoring points as necessary. Shut off dewatering system at such a rate so as to prevent a quick upsurge of water that might weaken the subgrade. Installation, start-up, monitoring maintenance, and shut-off of the dewatering system shall be at no additional cost to the Owner.

J. Do not place fill when the subgrade is frozen, wet, loose, or soft.

K. Moisture control:
  1. Moisture content of materials prior to, and during compaction, shall be uniform throughout each layer of material.
  2. Granular materials shall be thoroughly wetted during or immediately prior to compaction.
  3. Supplementary water shall be added as required to materials by sprinkling and mixing uniformly throughout layer.
  4. Materials too wet for placing shall be temporarily spread or aerated until moisture content is acceptable. If these materials cannot be processed in time to use, the Contractor shall find alternatives acceptable to the CQA Consultant.

3.3 USE OF EXPLOSIVES

A. Blasting with any type of explosive must be in compliance with 3.4 of this Section.

3.4 ROCK EXCAVATION

A. Rock is defined as natural material that cannot be moved or ripped with a Caterpillar D9 equipped with a single tooth ripper or approved equal. A demonstration is required. The Contractor shall not remove rock until authorized by the Engineer.

B. All rock excavation shall be under one classification. This classification shall include solid ledge rock in its natural location that requires systematic quarrying, drilling, and/or blasting for its removal and also boulders that exceed 1 CY in volume.

C. When rock is encountered, strip free of earth. Employ an independent surveyor to determine rock quantities before removal operation begins. In computing the volumetric content of rock excavation for payment, the pay lines shall be taken as follows:
  1. For landfill cells: From rock surface to 2 FT below proposed subgrade and 10 FT outside the construction baseline.
  2. For structures: 3 FT outside the exterior limits of foundations and from rock surface to 6 IN below bottom of foundations.
  3. For piping and utilities: A width 18 IN wider than the outside diameter of the pipe or conduit and from rock surface to 6 IN below bottom exterior surface of the pipe or conduit.
  4. For paving: 2 FT outside the exterior limits of paving and from rock surface to 6 IN below bottom of pavement subbase.

D. The use of explosives shall be limited to the magnitude and location of the charge that will not cause damage to adjacent existing construction and utilities through shock vibrations or other stress loadings. Provide adequate blanket protection to ensure that there will not be fragments of rock or other debris flying through the air when discharging explosives. Any damage to existing construction or other features caused by blasting operations to be repaired and paid for by Contractor.
  1. Explosive permits shall be obtained from the appropriate local authorities.
  2. The Contract unit price for rock excavation shall include all equipment and materials and other work necessary for excavation and hauling the rock from the site, and for furnishing and placing suitable replacement material as specified in its place.

E. Where explosives and blasting are used, comply with all laws and ordinances of municipal, state and Federal agencies relating to the use of explosives. Use qualified personnel for blasting and take proper precautions to protect persons, property or the work from damage or injury from blast or explosion. Conduct preblast survey in the company of the CQA Consultant to aid in determining any damage caused by blasting.

3.5 FIELD QUALITY CONTROL

A. Moisture density relations, to be established by the CQA Consultant are required for all materials to be compacted.

B. Extent of compaction testing will be as necessary to assure compliance with Specifications.

C. Give minimum of 24 HR advance notice to the CQA Consultant when ready for compaction or subgrade testing and inspection.

D. Should any compaction density test or subgrade inspection fail to meet Specification requirements, perform corrective work as necessary.

E. Pay for all costs associated with corrective work and retesting resulting from failing compaction density tests.

3.6 COMPACTION DENSITY REQUIREMENTS

A. Obtain approval from Soils Engineer with regard to suitability of soils and acceptable subgrade prior to subsequent operations.

B. Provide dewatering system necessary to successfully complete compaction and construction requirements.

C. Remove frozen, loose, wet, or soft, material and replace with approved material as directed by Soils Engineer.

D. Stabilize subgrade with well graded granular materials as directed by Soils Engineer.

E. Assure by results of testing that compaction densities comply with the following requirements:
   1. Sitework:

SOIL TYPE	COMPACTION DENSITY
Cohesive Soils	95 percent, ASTM D698
Cohesionless Soils	75 percent relative density per ASTM D4253 and D4254
Structural Fill Under Slabs-On-Grade	75 percent relative density per ASTM D4253 and D4254

   2. Perform testing at a minimum frequency of 1 test per lift per 10,000 square feet.

3.7 FINISH GRADING

A. Grade all areas disturbed by construction operations.

B. Grade to smooth, uniformly sloping surfaces to existing elevations or to finish elevations shown on drawings.

C. Grading shall be to a tolerance of 0.1 FT. (plus/minus) unless otherwise noted elsewhere in these specifications or in the accompanying CQA/CQC Plan.

D. Evenly slope finished grade away from structures as shown on drawings to provide drainage.

3.8 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES

A. General:
   1. In general, work includes, but is not necessarily limited to, excavation for structures and retaining walls, removal of underground obstructions and undesirable material, backfilling, filling, and fill, backfill, and subgrade compaction.
   2. Obtain fill and backfill material necessary to produce grades required. Materials and source to be approved by Soils Engineer. Excavated material approved by Soils Engineer may also be used for fill and backfill.
   3. In this Section of the Specifications, the word "foundations" includes footings, base slabs, foundation walls, mat foundations, grade beams, piers and any other support placed directly on soil.
   4. In the paragraphs of this Section of the Specifications, the word "soil" also includes any type of rock subgrade that may be present at or below existing subgrade levels.

B. Excavation Requirements for Structures:
   1. General. Do not commence excavation for foundations for structures until:

   - a. Soils Engineer approves:
     - 1) The removal of topsoil and other unsuitable and undesirable material from existing subgrade.
     - 2) Density and moisture content of site area compacted fill material meets requirements of specifications.
     - 3) Site surcharge or mass fill material can be removed from entire construction site or portion thereof.
     - 4) Surcharge or mass fill material has been removed from construction area or portions thereof.
   - b. Engineer grants approval to begin excavations.
2. Dimensions:
   - a. Excavate to elevations and dimensions indicated or specified.
   - b. Allow additional space as required for construction operations and inspection of foundations.
3. Removal of obstructions and undesirable materials in excavation includes, but is not necessarily limited to, removal of old foundations, existing construction, unsuitable subgrade soils, expansive type soils, and any other materials which may be concealed beneath present grade, as required to execute work indicated on Contract Drawings. If undesirable material and obstructions are encountered during excavation, remove material and replace as directed by Soils Engineer.
4. Level off bottoms of excavations to receive foundations, floor slabs, equipment support pads, or compacted fill. Remove loose materials and bring excavations into approved condition to receive concrete or fill material. Where compacted fill material must be placed to bring subgrade elevation up to underside of construction, scarify existing subgrade upon which fill material is to be placed to a depth of 6 IN and then compact to density stated in this Section of Specifications before fill material can be placed thereon. Do not carry excavations lower than shown for foundations except as directed by Soils Engineer or Engineer. If any part of excavations is carried below required depth without authorization, maintain excavation and start foundation from excavated level with concrete of same strength as required for superimposed foundation, and no extra compensation will be made to Contractor therefore.
5. Notify Soils Engineer and Engineer as soon as excavation is completed in order that subgrades may be inspected. Do not commence further construction until subgrade under compacted fill material, under foundations, under floor slabs-on-grade, under equipment support pads, and under retaining wall footings has been inspected and approved by the Soils Engineer as being free of undesirable material, being of compaction density required by this specification, and being capable of supporting the allowable foundation design bearing pressures and superimposed foundation, fill, and building loads to be placed thereon. Soils Engineer shall be given the opportunity to inspect subgrade below fill material both prior to and after subgrade compaction.
   - a. Place fill material, foundations, retaining wall footings, floor slabs-on-grade, and equipment support pads as soon as weather conditions permit after excavation is completed, inspected, and approved and after forms and reinforcing are inspected and approved. Before concrete or fill material is placed, protect approved subgrade from becoming loose, wet, frozen, or soft due to weather, construction operations, or other reasons.

6. Dewatering: Where groundwater is or is expected to be encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade below foundations and fill material, to allow foundations and fill material to be placed in the dry, and to maintain a stable excavation side slope. Groundwater shall be maintained at least 3 FT below the bottom of any excavation. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation. Employ dewatering specialist for selecting and operating dewatering system. Keep dewatering system in operation until dead load of structure exceeds possible buoyant uplift force on structure. Dispose of groundwater to an area which will not interfere with construction operations or damage existing construction. Install groundwater monitoring wells as necessary. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
7. Subgrade stabilization: If subgrade under foundations, fill material, floor slabs-on-grade, or equipment support pads is in a frozen, loose, wet, or soft condition before construction is placed thereon, remove frozen, loose, wet, or soft material and replace with approved compacted material as directed by Soils Engineer. Provide compaction density of replacement material as stated in this specification section. Loose, wet, or soft materials, when approved by Soils Engineer, may be stabilized by a compacted working mat of well graded crushed stone. Compact stone mat thoroughly into subgrade to avoid future migration of fines into the stone voids. Remove and replace frozen materials as directed by Soils Engineer. Method of stabilization shall be performed as directed by Soils Engineer. Do not place further construction on the repaired subgrades, until the subgrades have been approved by the Soils Engineer.
8. Do not place floor slabs-on-grade including equipment support pads until subgrade below has been approved, piping has been tested and approved, reinforcement placement has been approved, and Contractor receives approval to commence slab construction. Do not place building floor slabs-on-grade including equipment support pads when temperature of air surrounding the slab and pads is or is expected to be below 40 DegF before structure is completed and heated to a temperature of at least 50 DegF.
9. Drainage: Control grading around structures so that ground is pitched to prevent water from running into excavated areas or damaging structures. Maintain excavations where foundations, floor slabs, equipment support pads or fill material are to be placed free of water. Provide pumping required to keep excavated spaces clear of water during construction. Should any water be encountered in the excavation, notify Engineer and Soils Engineer. Provide free discharge of water by trenches, pumps, wells, well points, or other means as necessary and drain to point of disposal that will not damage existing or new construction or interfere with construction operations.
10. Frost protection: Do not place foundations, slabs-on-grade, equipment support pads, or fill material on frozen ground. When freezing temperatures may be expected, do not excavate to full depth indicated, unless foundations, floor slabs, equipment support pads, or fill material can be placed immediately after excavation has been completed and approved. Protect excavation from frost if placing of concrete or fill is delayed.
    a. Where a concrete slab is a base slab-on-grade located under and within a structure that will not be heated, protect subgrade under the slab from becoming frozen until final acceptance of the Project by the Owner.
    b. Protect subgrade under foundations of a structure from becoming frozen until structure is completed and heated to a temperature of at least 50 DegF.

C. Fill and Backfill Inside of Structure and Below Foundations, Base Slabs, Floor Slabs, Equipment Support Pads and Piping:
1. Structural fill under floor slabs-on-grade: Place all floor slabs-on-grade on a minimum of 6 IN of structural fill unless otherwise indicated.

2. Fill and backfill placement: Prior to placing fill and backfill material, optimum moisture and maximum density properties for proposed material shall be obtained from Soils Engineer. Place fill and backfill material in thin lifts as necessary to obtain required compaction density. Compact material by means of equipment of sufficient size and proper type to obtain specified density. Use hand operated equipment for filling and backfilling next to walls. Do not place fill and backfill when the temperature is less than 40 DegF and when subgrade to receive fill and backfill material is frozen, wet, loose, or soft. Use vibratory equipment to compact granular material; do not use water.
3. Where fill material is required below foundations, place fill material, conforming to the required density and moisture content, outside the exterior limits of foundations located around perimeter of structure the following horizontal distance whichever is greater:
    a. As required to provide fill material to indicated finished grade.
    b. 5 FT.
    c. Distance equal to depth of compacted fill below bottom of foundations.
    d. As directed by Soils Engineer.

D. Filling and Backfilling Outside of Structures. This paragraph of these specifications apply to fill and backfill placed outside of structures above bottom level of both foundations and piping but not under paving. Provide material as approved by Soils Engineer for filling and backfilling outside of structures.

1. Fill and backfill placement: Prior to placing fill and backfill material, obtain optimum moisture and maximum density properties for proposed material from Soils Engineer. Place fill and backfill material in thin lifts as necessary to obtain required compaction density. Compact material with equipment of proper type and size to obtain density specified. Use only hand operated equipment for filling and backfilling next to walls and retaining walls. Do not place fill or backfill material when temperature is less than 40 DegF and when subgrade to receive material is frozen, wet, loose, or soft. Use vibratory equipment for compacting granular material; do not use water.
2. Backfilling against walls:
    a. Do not backfill around any part of structures until each part has reached specified 28-day compressive strength and backfill material has been approved. Do not start backfilling until concrete forms have been removed, trash removed from excavations, pointing of masonry work, concrete finishing, dampproofing and waterproofing have been completed.
    b. Do not place fills against walls until floor slabs at top, bottom, and at intermediate levels of walls are in place and have reached 28-day required compressive strength to prevent wall movement.
    c. Bring backfill and fill up uniformly around the structures and individual walls, piers, or columns.

3.9 SPECIAL REQUIREMENTS

A. Erosion Control: Conduct work to minimize erosion of site. Construct stilling areas to settle and detain eroded material. Remove eroded material washed off site. Clean streets daily of any spillage of dirt, rocks, or debris from equipment entering or leaving site.

END OF SECTION

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SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Excavation, trenching, backfilling and compacting for all underground utilities.
  2. Leachate piping.
  3. Removal of existing piping.
  4. Surface drainage conduits and piping.
  5. All related utility and process appurtenances.

B. Related Sections include but are not necessarily limited to:
  1. Division 1 - General Requirements.
  2. Section 02220 - Earthwork.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
  1. American Society for Testing and Materials (ASTM):
    a. C33, Standard Specification for Concrete Aggregates.
    b. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft3).
    c. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/f(2,700 kN-m/m)).
    d. D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System.
    e. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
    f. D4254, Minimum Index Density of Soils and Calculation of Relative Density.

B. Qualifications:
  1. Hire an independent soils laboratory to conduct in-place moisture-density tests for backfilling to assure that all work complies with this Specification.
  2. Registered professional engineer licensed in Virginia for design of trench shoring systems or other trench safety plans.

1.3 DEFINITIONS

A. Excavation:
  1. All excavation will be defined as unclassified.

1.4 SUBMITTALS

A. See Section 01340.

B. Submit test reports and fully document each with specific location or stationing information, date, and other pertinent information.

C. Submit respective pipe or conduit manufacturer's data regarding methods of installation and general recommendations.

D. Submit sieve analysis reports on all granular materials.

1.5 PROJECT CONDITIONS

A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.

B. Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent serious interruption of travel.

C. Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.

D. Verify location of existing underground utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Material:
1. As approved by Engineer.
   a. Free of rock cobbles, roots, sod or other organic matter, and frozen material.
   b. Moisture content at time of placement: 3 percent plus/minus of optimum moisture content as specified in accordance with ASTM D1557.

B. Bedding Materials:
1. As approved by the Soils Engineer.
2. Granular bedding materials:
   a. ASTM C33, meeting VDOT No. 25 stone, or as specifically approved by the Engineer.

PART 3 - EXECUTION

3.1 GENERAL

Remove and dispose of unsuitable materials as directed by Soils Engineer to site provided by Owner.

3.2 EXCAVATION

A. Unclassified Excavation:
1. Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by Soils Engineer.

B. Excavation for Appurtenances:
1. 12 IN (minimum) clear distance between outer surface and embankment.
2. See Section 02220 for applicable requirements.

C. Trench Excavation:
1. Excavate trenches by open cut method to depth shown on Drawings and necessary to accommodate work.
   a. Tunnel work for crossing under crosswalks, driveways or existing utility lines with permission.
      1) Limit tunnels to 10 FT in length.
2. Open trench outside buildings, units, and structures:
   a. No more than the distance between two manholes, structures, units, or 600 LF, whichever is less.
   b. Field adjust limitations as weather conditions dictate.
3. Trenching within buildings, units, or structures:
   a. No more than 100 LF at any one time.

4. Any trench or portion of trench, which is opened and remains idle for 7 calendar days, or longer, as determined by the Owner, may be directed to be immediately refilled, without completion of work, at no additional cost to Owner. Said trench may not be reopened until Owner is satisfied that work associated with trench will be prosecuted with dispatch.
5. Observe following trenching criteria:
   a. Trench size.
      1) Excavate width to accommodate free working space.
      2) Maximum trench width at top of pipe or conduit may not exceed outside diameter of utility service by more than the following dimensions:

OVERALL DIAMETER OF UTILITY SERVICE	EXCESS DIMENSION
33 IN and less	18 IN
more than 33 IN	24 IN

      3) Cut trench walls vertically from bottom of trench to 1 FT above top of pipe, conduit, or utility service.
      4) Keep trenches free of water. Include cost of dewatering in original Bid.

D. Trenching for Electrical Installations:
1. Observe paragraph 3.2 C "Trench Excavation"
2. Modify for electrical installations as follows:
   a. Open no more than 600 LF of trench in exterior locations for trenches more than 12 IN but not more than 30 IN wide.
   b. Any length of trench may be opened in exterior locations for trenches which are 12 IN wide or less.
   c. Do not over excavate trench.
   d. Cut trenches for electrical runs with minimum 30 IN cover, unless otherwise specified.

3.3 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Over-Excavation:
1. Backfill and compact to 95 percent of maximum dry density per ASTM D698.
2. Backfill with granular bedding material as option.

B. Rock Excavation:
1. Excavate minimum of 6 IN below bottom exterior surface of the pipe or conduit.
2. Backfill to grade with suitable earth or granular material.
3. Form bell holes in trench bottom.

C. Subgrade Stabilization:
1. Stabilize the subgrade when directed by the Owner.
2. Observe the following requirements when unstable trench bottom materials are encountered.
   a. Notify Owner when unstable materials are encountered.
      1) Define by drawing station locations and limits.
   b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
      1) Replace with subgrade stabilization with no additional compensation.

3.4 BACKFILLING METHODS

A. Do not backfill until tests to be performed on system show system is in full compliance to specified requirements.

B. Carefully Compacted Backfill:
1. Furnish where indicated on drawings, specified for trench embedment conditions and for compacted backfill conditions up to 12 IN above top of pipe or conduit.
2. Comply with the following:
   a. Place backfill in lifts not exceeding 8 IN (loose thickness).

  - b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
  - c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
  - d. Compact each lift to specified requirements.

C. Common Trench Backfill:
- 1. Perform in accordance with the following:
  - a. Place backfill in lift thicknesses capable of being compacted to densities specified.
  - b. Observe specific manufacturer's recommendations regarding backfilling and compaction.
  - c. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.

D. Water flushing for consolidation is not permitted.

E. Backfilling for Electrical Installations:
- 1. Observe paragraph 3.4 C or D "Backfilling Methods."
- 2. Modify for electrical installation as follows:
  - a. Observe notes and details on electrical drawings for fill in immediate vicinity of direct burial cables.

3.5 COMPACTION

A. General:
- 1. Place and assure bedding, backfill, and fill materials achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work.
- 2. In no case shall degree of compaction below "Minimum Compaction" specified be accepted.

B. Compaction Requirements: Unless noted otherwise on Drawings or more stringently by other sections of these Specifications, comply with following trench compaction criteria:

MINIMUM COMPACTIONS

LOCATION	SOIL TYPE	DENSITY
1. Bedding Material:		
All Locations	Cohesionless Soils	75 percent of max relative density by ASTM D4253 and D4254
2. Carefully compacted backfill:		
Perimeter berms and perimeter road	Cohesive soils	95 percent of max dry density by ASTM D698
	Cohesionless soils	75 percent of max relative density by ASTM D4253 and D4254
3. Common trench backfill:		
Under pavements roadways surfaces, within highway right-of-ways	Cohesive soils	95 percent of max dry density by ASTM D698
	Cohesionless soils	75 percent of relative density by ASTM D4253 and D4254

Under turfed, sodded, plant seeded, non-traffic areas	Cohesive soils	85 percent of max dry density by ASTM D698
	Cohesionless soils	40 percent of relative density by ASTM D4253 and D4254

3.6 FIELD QUALITY CONTROL

A. Testing:
   1. Perform in-place moisture-density tests as directed by these Specifications and the CQA Plan.
   2. Perform tests through recognized testing laboratory approved by Owner.
   3. Perform additional tests as directed until compaction meets or exceeds requirements.
   4. Reference to Engineer in this section will imply Soils Engineer when employed by Owner and directed by Engineer to undertake necessary inspections as approvals as necessary.
   5. Assure Owner has immediate access for testing of all soils related work.
   6. Ensure excavations are safe for testing personnel.

END OF SECTION

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SECTION 02240

PROTECTIVE COVER AND LEACHATE COLLECTION LAYER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Protective Cover.
   2. Leachate collection stone.

B. Related Sections Include But Are Not Necessarily Limited To:
   1. Division 1 – General Requirements.
   2. Section 02220 – Earthwork.
   3. Section 02275 – Alternate Soil Liner System.
   4. Section 02775 – High-Density Polyethylene (HDPE) Membrane Liner.
   5. Section 02900 – Geotextile Fabric.
   6. Section 15064 – Pipe: Plastic.
   7. Construction Quality Assurance/Quality Control Plan.

1.2 QUALITY STANDARDS

A. Referenced Standards
   1. American Society for Testing and Materials:
      a. C117 or C136 - Particle Size Analysis.
      b. D2434 - Permeability of Granular Soils.
      c. D4373 - Calcium Carbonate Content of Soils.
      d. D5084 - Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
   2. Virginia Department of Transportation (VDOT), Standard Specifications for Roads and Structures current edition.

1.3 SUBMITTALS

A. See Section 01340: Submittals.

B. At least four weeks prior to construction of the leachate collection stone, submit a bulk sample of each material from each source to the CQA Consultant for approval.

C. Submit periodic surveys of each layer during construction for thickness verification. Frequency of survey submittals to be established between Contractor and CQA consultant prior to placement. Follow the CQA plan for surveying requirements.

1.4 JOB CONDITIONS

A. Take necessary precautions to protect synthetic landfill liner from damage due to any construction activity. Repair damages to liner at own expense. Assess no cost to Owner, Engineer, or auxiliary party for any damages to liner system or pipe resulting from placement of stone or activities of equipment operating on stone.

B. Protect and maintain benchmarks, monuments, or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.

1.5 TOLERANCES

A. Materials shall be placed to the lines and grades as shown on the Contract Drawings except that a 2 IN overbuild is allowed. Material placed beyond these limits shall be removed at Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Material: The CQA Consultant shall test borrow stockpiles prior to delivery to the site.
   1. Free of roots, sod or other organic matter, and frozen material. The material shall be of durable and of noncarbonaceous origin.
   2. Materials must meet acceptance criteria presented in 3.2 of this Specification.
   3. Materials may be natural or manufactured.

B. Interface Friction Tests:
   1. Test materials using ASTM D 5321. Section 01060-Special Conditions, paragraph 1.16, outlines the conditions under which this material shall be tested.
   2. This material is part of a system. The system shall meet the requirements before the component materials can be deemed acceptable.
   3. The costs associated with this testing shall be included in the Bid price for each material. Any retesting or other additional testing required to meet the Specification shall be at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 GENERAL

A. The protective cover material (leachate collection layer) is placed directly over the liner system (gecomposite); thus, extreme caution shall be exercised by the Contractor to prevent damage to the liner system materials.

B. Placement of these materials within the cell shall be conducted only when the CQA Consultant or his representative is present at the site and informed in advance of the intent to complete this work.

C. The Contractor shall exercise care in maintaining a true line and grade on all piping during placement and spreading of the material.

D. Materials shall be placed over the Geomembrane only after areas have been released by the Geomembrane Installer and the CQA Consultant. The materials shall be placed as specified below.
   1. All materials shall be placed and spread with low ground pressure equipment (6 psi ground pressure or less) as approved by the Engineer to reduce potential damage to the Geomembrane. The Geomembrane surface shall be off limits to construction traffic. Hard turning of tracked equipment on the stone must be avoided.
   2. At least 12 IN of separation between the Geomembrane and all low ground pressure equipment shall be maintained.
   3. Material shall not be placed over standing water or ice.
   4. Material shall not be compacted within the cell limits.
   5. Material on slope shall be placed from the bottom to top of the slope.

E. The leachate collection layer shall be spread in a manner that minimizes development of folds in the Geosynthetics. Any portions of the Geosynthetics that develop crimp shall be repaired by the Contractor at no expense to the Owner.

1. If during spreading, excessive wrinkles develop, the Contractor shall adjust placement and spreading methods, or cease until the Geomembrane cools and wrinkles decrease in size.
2. Wrinkles that exceed approximately 6 IN in height and cannot be eliminated by amended placement and spreading methods shall be cut and repaired by the Geomembrane Installer in a method approved by the CQA Consultant.
3. This layer should be placed/spread prior to placing the leachate collection stone around the leachate collection piping.

F. Any damage to the underlying soil, Geomembrane liners or Geotextiles shall be repaired in accordance with the applicable Section of these Specifications at Contractor’s expense.

G. Stockpiling of materials within the limits of the cell shall be subject to advanced approval by the CQA Consultant. Any hauling equipment (dump trucks, etc.) operating within the cell limits, including access ramps, shall have a minimum of 3 FT. of separation between the vehicle wheels and the Geomembrane.

H. Any areas where unauthorized or tracked equipment has operated over the leachate collection system shall be subject to investigation for potential Geomembrane damage. Such investigations may include removal of overlying materials in the affected areas and visual inspection of the Geomembrane. These activities shall be conducted under direction by the CQA Consultant at Contractor's expense.

I. Test areas to evaluate potential damage due to equipment operations may be required by the CQA Consultant to assess equipment to be used by the Contractor. The test area shall be outside the cell limits, use scrap materials not to be used in cell construction, and model construction conditions as closely as is practical. Test area parameters shall be determined by the CQA Consultant and Contractor in advance of construction of the leachate collection system.

3.2 QUALITY CONTROL

A. Ensure CQA Consultant has at all times immediate access for the testing of all related work.

B. Assure by results of CQC testing that materials and installation comply with the following requirements:

Required Test	Minimum Frequency	Protective Cover Layer	Leachate and Ground Water Collection Stone
1. Gradation ASTM D422	1 per 1,500 CY or portion thereof	Each material	VDOT #57
2. Permeability, K ASTM D5084 or D2434	1 per 3,000 CY or portion thereof	K ≥ 1.2E-4 cm/sec	K≥ 1E-1cm/sec
3. Carbonate Content ASTM D4373	1 per material source	<15% by weight	<15% by weight
4. Thickness	8 per acre (Survey Points)	As Specified	As Specified

C. Permeability testing shall be performed for protective cover materials.

END OF SECTION

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SECTION 02241

VEGETATIVE SUPPORT LAYER (VSL)

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment and services for installation and placement of the VSL, as indicated, in accordance with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation.
   4. See Division 1 for General Requirements.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02220: Earthwork

B. Section 02774: LLDPE Geomembrane Liner System.

C. Section 02900: Geotextiles.

D. Section 15064: Pipe: Plastic

1.3 QUALITY STANDARDS

A. Referenced Standards.
   1. American Society for Testing and Materials:
      a. D422 – Particle Size Analysis.
      b. D2434 – Permeability of Granular Soils.
      c. D4318 – Liquid Limit, Plastic Limit, and Plasticity Index of Soils
      d. D5084 – Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
   2. Virginia Department of Transportation (VDOT), Road and Bridge Specifications, current edition.
   3. Refer to “Construction Quality Assurance Plan” prepared for the owner.

1.4 SUBMITTALS

A. See Section 01300: Submittals

B. At least four weeks prior to construction of the VSL, submit a bulk sample of each material from each source to the CQA Consultant for approval.

C. Submit all required laboratory test data as required by Subparts 2.1 and 3.2 for materials used in the construction.

1.5 JOB CONDITIONS

A. Take necessary precautions to protect geomembrane liner and geocomposite from damage due to any construction activity. Repair damages to liner at own expense. Assess no cost to Owner, Engineer, or auxiliary party for any damages to liner system or pipe resulting from placement of soil or activities of equipment operating on soil.

B. Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.

1.6 TOLERANCES

A. Materials shall be placed to the lines and grades as shown on the Contract Drawings except that a 2-inch overbuild is allowed. Material placed beyond these limits shall be removed at Contractor's expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Material: The Contractor shall submit source test data to the CQA Engineer from borrow stockpiles prior to delivery to the site.
   1. Materials must be free of roots, sod or other organic matter, and frozen material. The material shall be of durable and of noncarbonaceous origin.
   2. Materials must meet acceptance criteria presented in 3.2 of this Section.
   3. VSL shall consist of natural soils with maximum particle size of 1 inch.
   4. A minimum effective interface friction angle of 25 degrees.

PART 3 - EXECUTION

3.1 GENERAL

A. The VSL is placed directly over the geocomposite drainage layer; thus, extreme caution shall be exercised by the Contractor to prevent damage to this material.

B. Placement of the VSL shall be conducted only when the CQA Consultant or their representative is present at the site and informed in advance of the intent to complete this work.

C. The Contractor shall exercise care in maintaining a true line and grade of all piping during placement and spreading of the layer.

D. The VSL shall be placed over the geocomposite drainage layer only after areas have been released by the Installer and the CQA Consultant. The layer shall be placed as specified below:
   1. The layer shall be placed and spread with low ground pressure equipment (6 psi ground pressure or less) as approved by the Engineer to reduce potential damage to the geomembrane liner. The geomembrane liner surface shall be off limits to construction traffic. Excessive hard turning of tracked equipment on the VSL must be avoided.
   2. At least 18 IN (18") of separation between the geomembrane liner and low ground pressure equipment shall be maintained and at least 36 IN of separation between the geomembrane liner and all other equipment.
   3. The layer shall not be placed over standing water or ice.
   4. The layer shall not be compacted within the limits.

E. The VSL shall be spread in a manner that minimizes development of tears in the geomembrane liner and wrinkles and folds in the geocomposite drainage layer.

F. Any damage to the underlying geomembrane liner or geocomposite drainage layer shall be repaired in accordance with the applicable section of these Specifications at Contractor expense.

G. Stockpiling of materials shall be subject to advanced approval by the CQA Consultant.

H. Test areas to evaluate potential damage due to equipment operations may be required by the CQA Consultant to assess equipment to be used by the Contractor. The test area shall be outside the limits, use scrap materials not to be used in construction, and model construction conditions as closely as is practical. Test area parameters shall be determined by the CQA Consultant and Contractor in advance of construction of the VSL.

3.2 QUALITY CONTROL

A. The CQA Consultant shall perform testing of VSL material.

B. Ensure CQA Consultant has at all times immediate access for the testing of all related work.

TABLE A

Minimum CQA Testing Frequency

Components	Minimum Required Test	Minimum Sample Frequency / Location	Acceptance Criteria
VSL Layer	1. Thickness	1 per Acre	18” to 20”
	2. USCS Classification	1 per 20,000 cy	SM, SC, MH, ML, SW, SP
	3. Gradation	1 per 10,000 cy	<15% Fines (Passing No. 200)
	4. Cohesion	1 per 60,000 cy	Min. 50 PSF
	5. LL, PL, PI	1 per 20,000 cy	

END OF SECTION

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SECTION 02260

TOPSOIL LAYER

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
  1. Furnish all labor, materials, tools, equipment, and services the topsoil layer and finished grading, as indicated, in accord with provisions of Contract Documents.
  2. Completely coordinate with work of all other trades.
  3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
  4. See Division 1 for General Requirements.

B. Related work specified elsewhere:
  1. Section 02220 - Earthwork.
  2. Section 02221 – Trenching, Backfilling, and Compacting.
  3. Section 02485 - Seeding.

C. Location of Work: All areas within limits of construction and all other areas which are disturbed in the course of the work.

1.2 QUALITY STANDARDS

A. Virginia Erosion & Sediment Control Handbook, Current Edition.

1.3 JOB CONDITIONS

A. Verify amount of topsoil required to complete work.

B. Finish grading tolerance: 0.2 foot plus/minus from required elevations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
  1. Original surface soil typical of the area, capable of supporting long-term native plant growth.
  2. Stockpiled soil from stripping existing vegetative material for subbase preparation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Correct, adjust and/or repair rough graded areas.
  1. Cut off mounds and ridges.
  2. Fill gullies and depressions.
  3. Perform other necessary repairs.
  4. Bring all sub-grades to specified contours, even and properly compacted.

B. Loosen surface to depth of two (2) inches, minimum.

C. Remove all stones and debris over two (2) inches in any dimension.

3.2 PLACING TOPSOIL LAYER

A. Place 6 inches of topsoil material on top of the vegetative support layer (total amount of soil above the geocomposite drainage layer to be 24 inches). The topsoil material may be blended with the vegetative support layer soil if Contractor can demonstrate that the blended material is capable of supporting long-term native plant growth.

B. Do not place topsoil when subgrade is either wet or frozen enough to cause clodding.

C. Spread topsoil to compacted depth as detailed in the construction drawings.

D. Make finished surface free of stones, sticks, or other material one (1) IN or more in any dimension.

E. Make finished surface smooth and true to required grades.

F. Restore areas occupied stockpiles to condition of rest of finished work.

3.3 ACCEPTANCE

A. Upon completion of topsoiling, obtain Project Manager’s acceptance of grade and surface.

B. Make test holes where directed to verify proper placement and thickness of topsoil.

END OF SECTION

SECTION 02270

SOIL EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil erosion and sediment control.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Division 2 - Section 02220, Earthwork.
   3. Division 2 - Section 02485, Seeding.
   4. Division 3 - Section 03002, Concrete.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Virginia Erosion and Sediment Control Planning Handbook, or current edition.
   2. Virginia Department of Transportation Standard Specifications for Roads and Structures Construction, Latest edition.
   3. City of Suffolk, VA, Erosion Control Ordinance & Program.

1.3 SITE CONDITIONS

A. The Owner has installed sediment control features for their current operations.

B. The Contractor may use these existing features with the Owner’s prior approval, provided the Contractor maintains said features.

1.4 SUBMITTALS

All appurtenances necessary to completely install erosion and sediment control features.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Straw bales, twine tied, and staked as per plans.

B. Stone for Stone Filter: 2 IN graded gravel or crushed stone constructed as per the Plans/Drawings.

C. Temporary Grass Seed: Refer to Section 02485, Seeding (annual rye grass).

D. Silt Fence: Premanufactured or constructed on site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to Disturbance:
   1. Install straw bales/silt fence, ditches, and channels.
   2. Excavate and shape sediment basins and traps.
   3. Construct pipe spillways and install stone filter where required.

4. Machine compact all berms, dikes, and embankments for basins and traps in accordance with Section 02220.
5. Refer to the construction sequence on the plans for further detail.

B. Temporarily seed basin slopes and stockpiles:
   1. Refer to Section 2485, Seeding, for application rates.
   2. Reseed as required until good stand of grass is achieved.

3.2 DURING CONSTRUCTION PERIOD

A. Maintain Basins, Dikes, Traps, Stone Filters, Straw Bales, Etc.:
   1. Inspect regularly especially after rainstorms.
   2. Repair or replace damaged or missing items.

B. After rough grading, sow temporary grass cover over all exposed earth areas not draining into sediment basin or trap.

C. Construct inlets as soon as possible.
   1. Excavate and tightly secure silt fence straw bales, or stone filters (dikes) completely around inlets.

D. Provide necessary swales, dikes and temporary culverts to control erosion. Contractor shall provide all erosion protection measures at no additional cost to the Owner to prevent off-site sediment/erosion. Although there is a sediment channel on-site, the Contractor shall take all reasonable precautions to reduce sediment transport to the channel.

E. Do not disturb existing vegetation (grass and trees).

F. Excavate sediment out of basins and traps when capacity has been reduced by 40 percent.
   1. Remove sediment from siltfence to prevent overtopping.

G. Topsoil and Fine Grade Slopes and Swales, Etc.:
   1. Seed and mulch as soon as areas become ready.

H. The erosion control features shown on the plans are performance based. If the feature does not adequately control erosion and sediment control to the satisfaction of the project manager, the contractor will be required to install additional erosion and sediment control features. The project manager will work with the contractor to determine the extent of the additional measures.

I. After fine grading, seed all areas receiving final cover.

3.3 NEAR COMPLETION OF CONSTRUCTION

A. Eliminate temporary basins, dikes, traps, etc.

B. Grade to finished or existing grades.

C. Fine grade all remaining earth areas, then seed and mulch in accordance with Section 02485, Seeding.

END OF SECTION

SECTION 02275

GEOLOGIC BUFFER LAYER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil used in the containment system.

B. Related Sections include but are not necessarily limited to:
   1. Section 02220 - Earthwork.
   2. Section 02775 – High Density Polyethylene (HDPE) Membrane Liner.
   3. Section 02800 - Geosynthetic Clay Liner (GCL).
   4. Construction Quality Assurance/Quality Control Plan.

1.2 QUALITY STANDARDS

A. Reference Standards:
   1. ASTM - American Society for Testing and Materials:
      a. ASTM D-422 - Particle Size Analysis.
      b. ASTM D-698 - Standard Proctor.
      c. ASTM D-854 - Specific Gravity.
      d. ASTM D-1140 - Fines Content in Soils.
      e. ASTM D-1556 - In-situ Density Measurement Using the Sand Cone.
      f. ASTM D-1557 - Modified Proctor.
      g. ASTM D-2166 - Unconfined Compressive Strength.
      h. ASTM D-2216 - Moisture Content Using Over-Dry Method.
      i. ASTM D-2487 - Soils Classification.
      j. ASTM D-2573 - Field Vane Shear Test.
      k. ASTM D-2922 - In-situ Density Using Nuclear Methods.
      l. ASTM D-3017 - In-situ Moisture Content Using Nuclear Methods.
      m. ASTM D-4318 - Atterberg Limits.
   2. USEPA - United States Environmental Protection Agency
      a. EPA/600/R-93/182 -"Quality Assurance and Quality Control for Waste Containment Facilities," September, 1993.
   3. ASCE – American Society of Civil Engineers.
      a. ASCE Paper No. 25333 – Water Content – Density Criteria for Compacted Soil Liners (Daniel et at, 1998).
   4. Construction Quality Assurance (CQA) Plan.

1.3 SUBMITTALS

A. See Section 01340 – Submittals and Section 01060 – Special Conditions.

B. Submit periodic surveys during construction for thickness verification to the CQA Consultant. Schedule of survey submittals to be established between Contractor and CQA Consultant prior to placement.

C. Refer to the CQA Plan.

D. Contractor to coordinate and schedule all activities with the CQA at least 5 days in advance. Any delays resulting from the failure of the Contractor to do so are at the Contractor sole expense. Contractor to provide schedules to Engineer in advance.

E. Borrow source characterization study as outlined in Part 2 of this specification.

1.4 JOB CONDITIONS

A. Verify conditions of subgrade prior to commencing work.

1.5 TOLERANCES

A. The geologic buffer layer system must meet the following tolerances:
   1. The thickness of the geologic buffer layer must be equal to or greater than 12 inches.
   2. The work should be constructed to lines, grades, and control points indicated on the Drawings, and shall be controlled and documented with survey methods. Laser based survey systems are preferred for grading.
   3. Finished grade tolerance; required elevation minus 0.00 feet to plus 0.10 feet.

B. The Contractor is responsible for certifying the Work is constructed to the specified tolerances and for providing sealed surveys supporting the certification.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Natural Fine-Grained Soil
   1. Classification: Natural soil shall have a classification of SC, SM, CH, CL, MH, or ML as determined by ASTM D2488.
   2. Grain sizes shall be within the following gradation:

Sieve Size	Percent Passing by Weight
3/4 IN	100
No. 4	> 90
No. 200	> 10*

*The geologic buffer layer should have greater than 10 percent fines (i.e., finer than a No. 200 sieve) unless the material being utilized meets the classification and compaction requirements.

B. Interface Friction Tests.
   1. Test materials using ASTM D 5321. Section 01060. Special Conditions, paragraph 1.16, outlines the conditions under which this material shall be tested.
   2. This material is part of a system. The system shall meet the requirements before the component material can be deemed acceptable.
   3. The costs associated with this testing shall be included in the Bid price for each material. Any retesting or other additional testing required to meet the Specifications shall be at no additional cost to the Owner.

2.2 GEOLOGIC BUFFER LAYER MATERIAL ACCEPTANCE

A. General: All imported, on-site, and processed materials specified in this Section are subject to the following requirements:

B. Sampling and testing required herein shall be done at the Contractor's sole expense.

C. Fine-Grained Material Dewatering, Mixing, and Staging
   1. Dewatering of geologic buffer layer borrow excavations, if required, shall be solely at the Contractor’s expense.
   2. Drying, blending, or wetting required to maintain the geologic buffer layer soil at a suitable moisture content shall be solely at the Contractor’s expense.

2.3 EQUIPMENT

A. Compaction Equipment:

1. The compaction equipment shall be of a suitable type, adequate to obtain the permeability specified, that provides a kneading action, such as a wobble-wheeled roller or a sheepsfoot roller having tines as long as the maximum loose lift thickness to ensure proper lift interface compaction free of voids.
2. The CQA Consultant shall confirm compaction equipment adequacy, and recommend changes if required. Such additional equipment will be provided by Contractor at no additional cost.
3. The compaction equipment shall be maintained and operated in a condition that will deliver manufacturer's rated compactive effort.
4. Hand-operated equipment shall be capable of achieving specified soil densities.
5. The finished surface of the final lift shall be rolled with a smooth steel drum roller or rubber-tired roller to eliminate tine or roller marks and provide a smooth, dense surface for geomembrane placement.

B. Moisture Control Equipment:
   1. Equipment for applying water shall be of a type and quality adequate for the work, shall not leak, and shall be equipped with a distributor bar or other approved device to assure uniform application.
   2. Equipment for mixing and drying out material shall consist of blades, discs, or other equipment defined by the CQA Consultant.
   3. Mixing of natural fine-grained soils may also be required to get even distribution of moisture.
   4. Geologic buffer layer material must not be compacted within 24 hours of the adjustment of water content by the addition of water.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The subgrade to be lined shall be smooth and free of vegetation, sticks, roots, foreign objects, and debris. It shall be the responsibility of the Contractor to keep the receiving surfaces in the accepted condition until complete installation of the liner is accomplished.

B. Proofrolling of the subgrade shall be conducted in accordance with Section 02220..

C. The geologic buffer layer shall be installed in a single 12 IN compacted lift. The material shall be placed consistent with criteria developed from construction of a satisfactory test strip.

D. When particles exceeding ¾ IN are observed at the final lift surface, they shall be removed by the Contractor prior to final rolling of the surface.

E. Equipment shall not have cleats or other protrusions of such length that would completely penetrate into the loose layer. Compaction shall be performed using appropriately heavy, properly ballasted compactor making a minimum number of passes as approved by the CQA Consultant.

F. If desiccation and crusting of the lift surface occurs, this area shall be scarified to a minimum depth of 2 IN. After scarification, the superficial material should be reworked to obtain a moisture content at least 2 percent above optimum moisture content. Alternately, the drier superficial soil may be stripped and mixed with additional moist soil to achieve a moisture content satisfying the project requirements.

G. No frozen material shall be placed.

H. During construction, exposed geologic buffer layer material should be sprinkled with water to minimize desiccation, as necessary. The Contractor is responsible to protect the geologic buffer layer from rain, drying, desiccation, erosion and freezing. All defective areas shall be repaired by the Contractor to the satisfaction of the CQA Consultant at no extra compensation.

I. At the end of each day's construction activities, completed sections of the compacted geologic buffer layer should be sealed. Common sealing methods include rolling with a rubber tired or smooth-drum roller, backdragging with a bulldozer, or placement of temporary cover soil over the compacted geologic buffer layer. The compacted geologic buffer layer should be sprinkled with water, as needed.

3.2 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

A. Refer to the CQA Plan.

B. The following field and laboratory quality control tests shall be performed by the CQA Consultant during geologic buffer layer construction:

Test	Method	Minimum Frequency	Acceptable Criteria
1. Field Density	ASTM D2937	1/10,000 SF/lift	≥ 95%
	or		
	ASTM D2937	1/5 D3017 tests	≥ 95%
	ASTM D3017	1/10,000 SF/lift	≥ 95%
2. Thickness	Surveyor	8 locations/acre	≥12 IN
3. Atterberg Limits	ASTM D4318	1/acre/lift	Materials Section
4. Particle Size	ASTM D422 and D1140	1/acre/lift	Materials Section
5. Laboratory Moisture Density Relationship	ASTM D698	1/5,000 CY of placed liner material	NA

C. Test frequencies may be modified by the CQA Consultant. If there are indications of declining or failing test results, frequencies may be increased.

D. Holes in the compacted geologic buffer layer created as a result of destructive testing (eg., thin-walled Shelby tube sampling and nuclear gauge, field density determinations) shall be backfilled and tamped by rod uniformly in 2 IN thick lifts. The backfill material shall be the same liner construction material or hydrated bentonite powder, if approved by the CQA Consultant. On the surface, the backfill material shall extend slightly beyond the holes to make sure that a good tie-in with the surrounding liner is achieved. Repaired areas shall be observed and documented by the CQA Consultant.

E. Give minimum of 24 HR advance notice to CQA Consultant when ready for soil testing and inspection in completed area of the geologic buffer layer.

F. The Contractor shall not place materials over an area that has not been tested by the CQA consultant.

G. For areas not meeting field and laboratory testing criteria, the Contractor shall scarify the full depth of the lift or replace the material as needed. The material shall be reshaped, rewetted as needed, rehomogenized and recompacted to the specified density. Areas not meeting the thickness requirements shall be augmented with additional materials. The added materials shall be reworked with the soil layer to ensure homogeneity and proper bonding. This may be done by scarification of the surface prior to addition of new material. The repaired area shall be properly documented, and field and laboratory quality control testing shall be performed to ensure the repaired liner section meets the requirements specified herein.

H. The Contractor shall pay for all costs associated with corrective work and retesting resulting from failing tests.

END OF SECTION

SECTION 02485
SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment and services for seeding in accordance with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. See Division 1 for General Requirements.

B. Related work specified elsewhere:
   1. Section 02220: Earthwork.
   2. Section 02221: Trenching, Backfilling, and Compacting for Utilities.
   3. Section 02260: Topsoil Layer.

C. Location of work: All disturbed areas and all areas receiving final cover.

1.2 QUALITY STANDARDS

A. Fertilizer testing: Current methods of Association of Official Agricultural Chemists.
   1. Testing will be conducted at the discretion of the Project Manager.

1.3 SUBMITTALS

A. See Section 01340.

B. Certificates for each grass seed mixture, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Certify that each container of seed delivered is fully labeled in accordance with Federal Seed Act and equals or exceeds specification requirements.

C. Copies of invoices for fertilizer, showing grade furnished and total quantity applied.

D. Contractor shall submit certified surveys in accordance with Section 01060, Special Conditions, to verify the extent of seeded areas for payment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Establish a smooth, healthy, uniform, close stand of grass from specified seed.

B. Grass seed: Fresh, clean, new-crop seed.
   1. Species, proportions and minimum percentage of purity, and germination as specified or Contractor may proposed alternate seed mixture that he believes will be more suitable for region and growing conditions. All seed mixtures must be approved by Engineer before use.
   2. Provide following grass seed mixtures:

Botanical Common Name	Pct. Weight	Min. Germ	Min. Purity
Kentucky 31 Fescue (Festuca var.)	65 pct.	85	97.0
Sericea Lespedeza	10 pct.	85	98.0
Annual Ryegrass*	10 pct.	90	97.0
Redtop Grass	5 pct.	80	94.0

Common Bermuda Grass**	10 pct.	80	94

* Use Foxtail Millet if planted May 1st through August. Use Winter Rye if planted November 16th through January.

** Use hulled seed if planted May through October.

C. Mulch: Clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, or other locally available mulch material.
   1. Do not use mulch containing a quantity of matured noxious weed seeds or other species that will be detrimental to seeding, or provide a menace to surrounding land.
   2. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

D. Fertilizer: Commercial fertilizer of 10-10-10 analysis, meeting applicable requirements of State and Federal law.
   1. Do not use cyanamic compounds of hydrated lime.

E. Limestone: agricultural grade ground limestone containing not less than 85 percent of combined calcium and magnesium carbonates.
   1. 60 percent passing 60 mesh sieve.
   2. 95 percent passing 10 mesh sieve.

F. Asphalt binder: Emulsified asphalt per State Specifications.

G. Water: Potable, free of substances harmful to growth.

H. Erosion Control Blankets: See Section 02720, Erosion Control Blankets.

2.2 DELIVERY, STORAGE AND HANDLING

A. Deliver seed in standard sealed containers labeled with producer's name and seed analysis, and in accord with US Department of Agriculture Rules and Regulations under Federal Seed Act.

B. Deliver fertilizer in original containers labeled with content analysis.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Perform seeding between September 1 and October 15 or upon approval of the Project Manager.

3.2 SOIL PREPARATION

A. Limit preparation to areas which will be planted soon after preparation.

B. Loosen surface to minimum depth of four (4) IN.

C. Remove stones over one (1) IN in any dimension, sticks, roots, rubbish and other extraneous matter.

D. Spread lime uniformly over designated areas at rate of 50 LB/1000 SF.

E. After application of lime, prior to applying fertilizer, loosen areas to be seeded with double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.

F. Distribute fertilizer uniformly over areas to be seeded a rate of 30 LB/1000 SF.
   1. Use suitable distributor.
   2. Incorporate fertilizer into soil to depth of at least two (2) IN.
   3. Remove stones or other substances which will interfere with turf development or subsequent mowing.

G. Grade seeded areas to smooth, even surface with loose, uniformly fine texture.
   1. Roll and rake, remove ridges and fill depressions, as required to meet finish grades.

2. Fine grade just prior to planting.

H. Restore seeded areas to specified condition if eroded or otherwise disturbed between fine grading and planting.

I. If fertilizer application rate is determined (by invoices submitted) to be less than that specified, apply additional fertilizer.

3.3 SEEDING

A. Do not use seed which is wet, moldy, or otherwise damaged.

B. Use approved mechanical power driven drills or seeders, or mechanical hand seeders, or other approved equipment.

C. Distribute seed evenly over entire area at not less than 4 LB/1000 SF, 50 percent sown in one direction, remainder at right angles to first sowing.

D. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds, excessive moisture, or other factors.

E. Resume work only when favorable condition develops.

F. Lightly rake seed into soil followed by light rolling or cultipacking.

G. Immediately protect seeded areas against erosion by mulching or placing netting.
   1. Spread mulch in a continuous blanket using 1-1/2 TON/ACRE to depth of 4 or 5 straws.
   2. Immediately following spreading mulch, secure with evenly distributed emulsified asphalt at rate of 200 gal/acre.
   3. Protect all seeded slopes greater than 2:1 (horizontal to vertical) against erosion with approved erosion control netting or mats. See Section 02720, Erosion Control Blankets.

3.4 MAINTENANCE

A. The Contractor shall maintain all seeded areas in a condition approved by Engineer until provisional acceptance by the Engineer. Maintenance shall include, but not be limited to, mowing, repair of seeded areas, and weed control. Protection shall be provided for all seeded areas against trespassing and damage. Slope shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly.

B. Mowing shall be schedule so as to maintain a minimum stand height of 4 inches. Stand height shall be allowed to reach 7-9 inches prior to mowing.

C. All seeded areas shall be inspected on a regular basis and any necessary repairs or reseeding made within the planting season, if possible.

D. After all necessary corrective work and cleanup has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the seeded areas. Maintenance of seeded areas shall cease on receipt of provisional acceptance.

3.5 GUARANTEE PERIOD AND FINAL ACCEPTANCE

A. All seeded areas shall be guaranteed for not less than 1 full year from the time of provisional acceptance.

B. At the end of the guarantee period, inspection will be made by the Owner upon written request submitted at least 10 days before the anticipated date. Seeded areas not demonstrating satisfactory stands as outlined below, as determined by the Owner, shall be renovated, reseeded and maintained meeting all requirements as specified herein.

C. After all necessary corrective work has been completed, the Owner shall certify in writing the final acceptance of the seeded areas.

D. A satisfactory stand will be defined as a section of grass of 10,000 square feet or larger that has
   1. No bare spots larger than 3 sq. ft.
   2. No more than 10 percent of total area with bare spots larger than 1 sq ft.
   3. Not more than 15 percent of total area with bare spots larger than 6-in square.

3.6 TEMPORARY SEEDING

A. Apply temporary seeding wherever further construction activity will not occur within 30 calendar days.

B. Apply 2-3 tons/acre of ground agricultural limestone and 200-1,000 lb/acre 10-10-10 fertilizer to areas receiving temporary seeding. Incorporate limestone and fertilizer into the top 4-6 inches of soil.

C. Apply seed at the following rates and incorporate into the upper ½ inch of soil:

Mixture	Rate	Dates
Rye (grain)	120 lbs/acre	January 1 – May 1
Annual Kobe Lespedeza	50 lbs/acre	January 1 – May 1
German Millet	40 lbs/acre	May 1 – August 15
Rye (grain)	120 lbs/acre	August 15 – December 30

D. Mulch in accordance with Paragraph 3.3.G

END OF SECTION

SECTION 02511

AGGREGATE COURSE

PART 1 - GENERAL

1.1 WORK INCLUDED

Crushed stone paving course, compacted.

1.2 RELATED WORK

A. Section 01340 - Submittals

B. Section 02220 - Earthwork

1.3 REFERENCES

A. Virginia Department of Transportation, Road and Bridge Specifications (VDOT), current edition.

1.4 TEST

A. Contractor to supply to Engineer certificate from supplier that material meets specifications.

B. Contractor to supply to Soils Engineer sample of material for determination of optimum moisture and density determination.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Material shall conform to VDOT Type 1 - #21A or #21B.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Construct aggregate course to grade, thickness, and typical section as indicated on drawings. Existing subgrade upon which aggregate course is to be placed shall be compacted in accordance with Section 02220.

B. Aggregate course shall be constructed in accordance with VDOT specification, Section 308 and 309.04 except that blade mixing will be permitted.

3.2 COMPACTION

A. Compact by vibrating or other approved methods to 95 percent maximum dry density as determined by ASTM D1557.

B. Any irregularities in the surface shall be corrected by scarifying, remixing, reshaping and recompacting until a smooth surface is secure.

C. The crushed stone will be tested for depth and density.

D. Since the existing road stone surfacing may be re-used for road upgrading, the CQA consultant may approve other stone surfacing materials and testing requirements (if any).

END OF SECTION

SECTION 02575

ENVIRONMENTAL CONTROL PROGRAM REQUIREMENTS

PART 1 - GENERAL

1.1 BACKGROUND

A. This Section has been prepared based on the limited environmental investigations performed at the proposed project site to date.

B. A site safety program shall be developed by the Contractor. The program will address:
   1. Personal safety requirements.

1.02 RELATED REQUIREMENTS

A. Section 01340 – Submittals.

B. Section 01500 – Construction Facilities and Temporary Controls.

C. Section 02220 – Earthwork.

C. Section 02221 – Trenching, Backfilling, and Compacting for Utilities.

1.3 DEFINITIONS

Health and Safety Inspector (provided by Contractor): On-site environmental safety inspector responsible for development and implementation of Contractor's site Health and Safety Plan, monitoring of site conditions and supervision of site personnel on health and safety issues. Health and Safety Inspector shall be appropriately certified.

1.4 ON-SITE HEALTH AND SAFETY

A. General: A Health and Safety Plan developed by the Contractor shall be used as basis for safety precautions to be undertaken during construction of those project work elements that involve potential exposure to toxic/hazardous landfill gas. The Health and Safety Inspector (HSI) will instruct all site personnel on the level of protection required. Protective clothing, respirators and other equipment may be required depending upon the potential exposure of workers to landfill gases. Upon start-up of Work, the Contractor shall have available, on-site, the items outlined in Paragraph 2.1 for use by all construction and on-site personnel if required.

B. All on-site personnel shall attend any required health and safety training provided by the HSI prior to initiation of work at the site.

C. The Health and Safety Plan shall identify the minimum frequency of the site visits to be made by the HIS. That frequency may not be less than quarterly.

1.5 MINIMUM QUALIFICATIONS

A. The Contractor shall have on staff, as a permanent employee, a qualified Health and Safety Inspector or shall subcontract with a qualified firm for such services. At a minimum, the Health and Safety Inspector (HSI) must have five (5) years of experience related to on-site monitoring and supervision of health and safety programs for construction related activities. The experience must include monitoring of atmospheric conditions for toxic gas, combustible gas, and oxygen deficiency. The Contractor shall provide written Certification to the Owner that his selected HSI meets this minimum qualification requirement. The Owner reserves the right to reject the HSI if the evidence submitted by, or investigation of, the HSI fails to satisfy the Owner that such HSI is properly qualified to carry out the obligations of the contract.

B. Contractor or his approved Health and Safety subcontractor shall provide all required equipment and services necessary for site monitoring and analysis in accordance with these Contract Documents.

1.6 SUBMITTALS

A. Submit Health and Safety Plan to the Engineer prior to initiating any construction activity.

B. Submit certification of Health and Safety Plan inspector or subcontractor to Engineer.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND SUPPLIES

A. All equipment, tools, etc. which have been in contact with hazardous materials shall be decontaminated with a water and detergent washdown and thorough rinse with spray equipment prior to leaving the site.

B. Equipment and Supplies for Decontamination: The Contractor shall supply all equipment and supplies required for decontamination for the duration of the project. A listing of the required supplies and equipment shall be included in the Contractor's Health and Safety Plan.

C. Equipment and Supplies for On-site Personnel: The Contractor shall provide all equipment and supplies for on-site personnel as required in the Contractor's Health and Safety Plan.

PART 3 - EXECUTION

3.1 COORDINATION AND PROJECT PROCEDURES

A. Coordinate Environmental Program requirements specified in this Section with other work or requirements as shown on drawings or specified in other Sections of the Contract Documents.

B. Sequence of work and general construction procedures shall be as follows:
   1. Contractor shall develop project Health and Safety Plan. Plan shall be submitted to Engineer before any further activities are commenced.
   2. Conduct on-site safety training in accordance with approved Health and Safety Plan.
   3. Prior to initiating excavation, HSI shall monitor the site for hazardous conditions.
   4. Based on findings, HSI shall establish protocol for continued monitoring as needed.
   5. As conditions warrant, the HSI shall be on-site or available as needed to monitor site conditions and to supervise personnel on health and safety issues.

END OF SECTION

SECTION 02720

EROSION CONTROL BLANKETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The erosion control blankets are for the purpose of erosion control and revegetation as described herein.

B. This work shall consist of furnishing and installation of the erosion control blankets, including fine grading, blanketing, stapling, and miscellaneous related work, in accordance with these standard specifications and at the location(s) identified on Drawings or designated by Engineer. This work shall include all necessary materials, labor, supervision and equipment for installation of a complete system.

C. All work of this Section shall be performed in accordance with the Conditions and Requirements of the Contract Documents.

D. The erosion control blankets shall be used where surface erosion is not desirable. The blankets shall be suitable for the following applications:

1. Channel and ditch linings.
2. Slope protection.

1.2 RELATED SECTIONS

A. Section 1340 - Submittals.

B. Section 02220 - Earthwork.

C. Section 02485 - Seeding.

1.3 PERFORMANCE REQUIREMENTS

A. Erosion control blankets shall provide a temporary, biodegradable cover material to reduce erosion and enhance revegetation.

1.4 SUBMITTALS

A. Submit product data on materials for erosion control blankets in accordance with Section 01300.

B. Any alternative system submitted for approval shall include complete design data, including test evidence of compliance to the essential design parameters of Project and reference installations similar in size and scope to that specified for Project.

1.5 SAMPLES

A. Submit product samples in accordance with Section 01300.

1.6 DELIVERY, STORAGE AND HANDLING

A. Erosion control blankets shall be furnished in rolls and wrapped with suitable material to protect against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labeled to provide identification sufficient for inventory and quality control purposes.

B. Erosion control blankets shall be free of defects that would interfere with the proper installation or impair the performance.

C. Erosion control blankets shall be stored by Contractor in a manner which protects them from damage by construction traffic.

PART 2 - PRODUCTS

2.1 EROSION CONTROL BLANKETS

A. Erosion control blankets shall meet required minimum permissible unit shear stresses as determined by Engineer.

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. Before placing erosion control blanket, the subgrade shall be inspected by Contractor to insure that it has been properly compacted; has been graded smooth; has no depressed, void, soft or uncompacted areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter; and has been seeded. Contractor shall not proceed until all unsatisfactory conditions have been remedied. By beginning construction, Contractor signifies his approval of preceding work.

B. Contractor shall fine grade the subgrade by hand dressing where necessary to remove local deviations.

C. No vehicular traffic shall be permitted directly on the blankets.

3.2 CHANNEL INSTALLATION

A. Erosion control blankets shall be installed as directed by the Engineer in accordance with manufacturer's instructions. The extent of erosion control blankets shall be as shown on Drawings.

B. Erosion control blankets shall be installed parallel to the flow of water. The first roll shall be centered longitudinally in mid-channel and anchored. Subsequent rolls shall follow from channel center outward.

C. Successive lengths of erosion control blankets shall be overlapped ("shingled") sufficiently for a common row of connections with the upstream end on top. Connect the overlap across the end of each of the overlapping lengths.

D. A trench shall be located at the upstream termination. Erosion control blanket shall be connected to the bottom of the trench. Backfill and compact the trench.

3.3 SLOPE INSTALLATION

A. Before placing erosion control blanket, the subgrade shall be inspected by Contractor to insure that it has been properly compacted; has been graded smooth; has no depressed, void, soft or uncompacted areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter; and has been seeded. Contractor shall not proceed until all unsatisfactory conditions have been remedied. By beginning construction, Contractor signifies his approval of preceding work.

B. Place on all slopes outside landfill construction baseline, excluding the stockpiles, on slopes greater than or equal to 3H:1V.

3.4 QUALITY ASSURANCE

A. Erosion control blankets shall not be defective or damaged. Any such problems shall be corrected by Contractor at no cost to Owner and to the satisfaction of Engineer.

3.5 CLEAN-UP

A. At the completion of this scope of work, Contractor shall remove from the job site and properly dispose of all remaining debris, waste materials, excess materials, and equipment required of or created by Contractor. Disposal of waste materials shall be solely the responsibility of Contractor and shall be done in accordance with applicable waste disposal regulations.

END OF SECTION

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SECTION 02775

HIGH-DENSITY POLYETHYLENE (HDPE) MEMBRANE LINER

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
  1. Furnish all labor, materials, tools, and equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of an impermeable, HDPE geomembrane liner as shown on Drawings and specified in accordance with provisions of the Contract Documents.
  2. Completely coordinate work with that of all other trades.
  3. Work items in project include, but are not necessarily limited to, the liner for the landfill lateral expansion.
  4. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.
  5. Furnish CQC Consultant to monitor work of Geomembrane Installer and to perform CQC testing in accordance with provisions of the Contract Documents.
  6. The Contractor, Geomembrane Installer, and CQC Consultant are required to attend the CQA/CQC Resolution Meeting and the CQA/CQC Preconstruction Meeting, Section 01200.

B. Related Sections include but are not necessarily limited to:
  1. Section 02220 - Earthwork.
  2. Section 02221 - Trenching, Backfilling, and Compacting.
  3. Section 02240 - Operational Cover and Leachate Collection Layer.
  4. Section 02275 – Geologic Buffer Layer.
  5. Construction Quality Assurance Plan.

1.2 QUALITY STANDARDS

A. Referenced Standards:
  1. American Society for Testing and Materials (ASTM).
     a. D638, Standard Test Method for Tensile Properties of Plastics.
     b. D792, Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
     c. D1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
     d. D1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
     e. D1603 Standard Test Method for Carbon Black in Olefin Plastics.
     f. D3015 Standard Practice for Microscopic Examination of Pigment Dispersion in Plastic Compounds. Refer to Subpart 2.2 for property to be tested.
     g. D3895 Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis.
     h. D4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
     i. D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
     j. D5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
     k. D5397 Procedure to Perform a Single Point Notched Constant Tensile Load – Appendix (SP-NCTL) Test.
     l. D5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.

    - m. D5721 Practice for Air-Oven Aging of Polyolefin Geomembranes.
    - n. D520 Pressured Air Channel Evaluation of Dual Seamed Geomembranes
    - o. D5885 Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry.
    - p. D5994 Test Method for Measuring the Core Thickness of Textured Geomembranes.
  - 2. The Geosynthetic Research Institute (GRI).
    - a. GM6 Pressurized Air Channel Test for Dual Seam Geomembranes.
    - b. GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet.
    - c. GM11 Accelerated Weathering of Geomembranes Using a Fluorescent UVA-Condensation Exposure Device.
    - d. GM12 Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gauge.
    - e. GM13 Standard Specification for Test Properties, Testing Frequency, and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembrane.

- B. Qualifications:
  - 1. Each geomembrane manufacturing or installation firm shall demonstrate 5 years continuous experience, including a minimum of 10,000,000 SF of HDPE geomembrane manufacture or installation.
  - 2. Geomembrane Installer Personnel Qualifications:
    - a. Installation Superintendent shall have worked in a similar capacity on at least five HDPE geomembrane liner jobs similar in size and complexity to the project described in the Contract Documents.
    - b. The Master Welder shall have completed a minimum of 5,000,000 sf of HDPE geomembrane seaming work using the type of seaming apparatus proposed for use on this Project.
    - c. Other welders shall have seamed a minimum of 1,000,000 sf of HDPE geomembrane.
  - 3. The CQC Consultant shall meet the qualification requirements of Section 01410 of these Specifications.

- C. CQA Plan Implementation: Construction Quality Assurance for the HDPE geomembrane installation will be performed for the Owner by the CQA Consultant in accordance with the CQA Plan prepared for this project. The work performed under the CQA Plan is paid for by the Owner and is not a part of this contract. The Contractor, CQC Consultant, and Geomembrane Installer, however, should familiarize themselves with the CQA Plan and are responsible for providing reasonable notice of and access to work elements that the CQA Consultant is required by the CQA Plan to overview.

1.3 SUBMITTALS

- A. Submit for Engineer's approval prior to placement of geomembrane liner, including:
  - 1. Manufacturer's Submittals.
    - a. Manufacturer's Quality Control (MQC) Program: Submit for review a complete description of the geosynthetic manufacturer's formal quality control program for manufacturing HDPE geomembrane. The MQC program shall at a minimum conform to GRI GM13 standards. The manufacturer shall reject resin and geomembrane that does not conform with the requirements of the approved MQC program.
    - b. Manufacturer's Field Installation Procedures Manual: Submit complete geomembrane manufacturer's specifications, descriptive drawings, and literature for the recommended installation of the HDPE geomembrane liner system, including recommended methods for handling and storage of all materials prior to installation, and field installation guidelines that the manufacturer feels are relevant and important to the success of this project. The manual clearly identifies any exceptions taken by the manufacturer in the specified execution of the Work. Unless excepted and approved by the Engineer, the procedures herein shall be considered part of the manual.

    c. Manufacturer's Material Data: Submit statement of planned production date(s) for the geosynthetics to be provided for this Project. Prior to shipment of geomembrane, submit quality control certificates for each roll demonstrating conformance with the requirements of these Specifications. Submit statement of production dates for the resin and the HDPE geomembrane for this work.
    d. Manufacturer's written acceptance of Geomembrane Installer's qualifications for installation of the HDPE geomembrane.
    e. Warranty: Submit a sample warranty in accordance with Paragraph 1.6 Warranties.
2. Geomembrane Installer's Submittals.
    a. The Geomembrane Installer will submit written documentation that their personnel satisfy the qualifications of 1.2 B.
    b. Geomembrane Installer's Construction Quality Control Program: Submit for review a complete description of the Geomembrane Installer's formal construction quality control programs to include, but not be limited to, product acceptance testing, installation testing, including both nondestructive and destructive quality control field testing of the sheets and seams during installation of the geomembrane, proposed methods of testing geosynthetic joints and connections at appurtenances for continuity, documentation and changes, alterations, repairs, retests, and acceptance.
    c. Geomembrane Installer's Installation Procedures Manual: Submit for approval the Installer's installation manual to include: ambient temperature at which the seams are made, control of panel lift up by wind, acceptable condition of the subsurface beneath the geomembrane, quality and consistency of the welding material, proper preparation of the liner surfaces to be joined, cleanliness of the seam interface (e.g., the amount of airborne dust and debris present), and proposed details for connecting the HDPE liner to appurtenances, i.e. penetrations of the containment facilities. The document shall include a complete description of seaming by extrusion welding and hot-wedge welding. The Geomembrane Installer's Installation Manual will by reference include requirements of the Manufacturer's Installation Manual unless exceptions are noted and approved by the Engineer. After this manual has been approved by the Engineer, the Geomembrane Installer shall not deviate from the procedures included in the manual.
    d. Geomembrane panel layout with proposed size, number, position, and sequencing of panels and showing the location and direction of all field joints. Joints shall be perpendicular to flow direction where possible, unless approved otherwise.
    e. Warranty: Submit a sample warranty in accordance with Paragraph 1.6 Warranties.
3. CQC Consultants Submittals:
    a. CQC Consultant shall submit written documentation that their personnel satisfy the qualifications of Section 01400.
    b. CQC Consultants CQC Geomembrane Manual: Submit CQC Consultant's written program for meeting the geomembrane material conformance and CQC requirements of these Specifications.
4. Provide all submittals in a single coordinated transmittal. Partial submittals will not be accepted. All submittals must be submitted prior to the Geomembrane Preconstruction Meeting, Section 01200.

B. Submittals for Engineer's Approval Required for Final Acceptance of HDPE Geomembrane Liner System:
1. Geomembrane Manufacturer’s submittals:
    a. Warranty: Submit signed warranty in accordance with Paragraph 1.6 Warranties.
2. Geomembrane Installer's Submittals.
    a. Warranty: Submit a warranty signed by the Geomembrane Installer that the installed geomembrane liner, attachments, and appurtenances are free of defects in material, manufacturing, and workmanship.

    b. Record Drawings: Submit reproducible drawings of record showing changes from the approved installation drawings. The record drawings shall include the identity and location of each repair, cap strip, penetration, boot, and sample taken from the installed geosynthetic for testing. The record drawings shall show locations of each type of material anchor trenches and the construction baseline.
    c. Welder Certification: Submit certification for each welder and performance records that include linear feet of weld completed, number of samples tested, and test failure rate for each welder. Submit field notes with daily equipment reports.
  3. CQC Consultant's Submittals.
    a. Certification: Submit written certification that the geomembrane liner was installed in accordance with this Specification and with the approved shop drawings.
    b. CQC Records: Submit copies of all material and seam test results. Each test shall be identified by date of sample, date of test, sample location, name of individual who performed the test, and standard test method used.
    c. CQC Weld Test Summary Report: The CQC Consultant shall submit a report showing normal distribution of all CQC seam test results, identifying the high, low, and average of the five coupon samples in each test.
  4. Provide all submittals in a single coordinated transmittal. Partial submittals will not be accepted.

1.4 PROJECT CONDITIONS

A. When the weather is of such a nature as to endanger the integrity and quality of the installation, whether this is due to rain, high winds, cold temperatures, or other weather elements, the installation of the geomembrane shall be halted at the direction of, or with the concurrence of, the Owner until the weather conditions are satisfactory.

B. The Contractor shall ensure that adequate dust control methods are in effect to prevent the unnecessary accumulation of dust and dirt on geosynthetic surfaces which hamper the efficient field seaming of geosynthetic panels.

C. The Contractor shall maintain natural surface water drainage diversions around the work area and provide for the disposal of water which may collect in the work area directly from precipitation falling within the area or from inadequate diversion structures or practices.

D. The Contractor shall be responsible to coordinate the installation of the leachate collection system which shall be in accordance with Geomembrane Installer's Installation Manual and as specified in these Specifications and shown on the Contract Drawings.

E. Vehicles will not be allowed on the liner area unless at least 24 inches of cover has been placed over the liner except as noted in these Specifications.

F. Vehicles larger than one and one-half ton pickup trucks are prohibited on the exterior berms. Contractor shall repair any damage to exterior berms prior to final payment.

1.5 DEFINITIONS AND RESPONSIBILITIES

A. Geomembrane Manufacturer: Manufacturer of geomembranes producing geomembrane sheets from resin and additives. The manufacturer is responsible for producing geomembrane sheet which complies with these Specifications. These responsibilities include but are not limited to:
  1. Acceptance of the resin and additives from chemical formulators. Testing of the raw resin and additives to ensure compliance with the manufacturer's specifications and with this Specification.
  2. Formulation of the resin and additives into geomembrane sheeting using mixing and extrusion equipment.
  3. Testing of the geomembrane sheet to ensure compliance with manufacturer's specification and this Specification.
  4. Shipping of the geomembrane sheet to installer designated facilities.

5. Certification of the raw materials and finished geomembrane sheet to comply with this Specification.
6. Certification of installer's training, experience, and methods for welding and inspection of geomembrane installations in compliance with manufacturer's standards.

B. Geomembrane Installer. Installer of geomembranes are responsible for handling, fitting, welding, and testing of geomembrane sheets or blankets in the field. These responsibilities include but are not limited to:

1. Acceptance (in writing) of the geomembrane from the manufacturer.
2. Acceptance (in writing) of the geologic buffer layer surface which will serve as a base for the geomembrane. This acceptance shall precede installation of the geomembrane, and shall state that the installer has inspected the surface, and reviewed the Specifications for material and placement, and finds all conditions acceptable for placement of geomembrane liners. The written acceptance shall explicitly state any and all exceptions to acceptance.
3. Handling, welding, testing, and repair geomembrane liners in compliance with this Specification and the Geomembrane Installer's Installation Procedures Manual.
4. Performance of QA/QC testing and record keeping as required by the approved Geomembrane Installer's Field Installation Procedures Manual.
5. Repair or replacement of defects in the geomembrane as required by the CQC Consultant or the CQA Consultant.

C. Engineer: Responsible for approval of submittals from the Contractor.

D. CQC Consultant: Responsible for observing field installation of the geomembrane and performance of material conformance and CQC testing to provide the Contractor with verbal and written documentation of the compliance of the installation with these Specifications. The CQC Consultant reports to the Contractor and is part of this contract.

E. CQA Consultant: Responsible for implementing CQA Plan including overviewing material conformance testing, field installation of the geomembrane, and CQC activities, and to perform limited CQA conformance testing to provide Owner with verbal and written documentation of the compliance of the installation with these Specifications. The CQA Consultant will use the written results of the CQC program and the CQA program in the preparation of the facility Certification Document. The CQA Consultant reports to the Owner and is not part of this contract.

F. Refer to the accompanying CQA Plan for additional definitions.

1.6 WARRANTIES

A. The Manufacturer’s warranty shall be against manufacturing defects and workmanship and against deterioration due to ozone, ultra- violet, and other exposure to the elements, for a period of 20 years on a pro rata basis from the date of project substantial completion, see Section 00500. The warranty shall be limited to replacement of material, and shall not cover installation of replacement geomembrane.

B. The geomembrane supplied shall be capable of preventing the leachate produced by the solid waste (refuse) from reaching the underlying soil. The material supplied including factory and field seams shall have a manufacturer's warranty that it will remain impermeable when exposed over twenty (20) years to a raw landfill leachate having the following range of values*:

LEACHATE QUALITY

Component	Range of Values**	
pH	3.6	8.5
Hardness (Carbonate)	35	8,120
Alkalinity (Carbonate)	310	9,500
Calcium	240	2,570
Magnesium	64	410

Sodium	85	3,800
Iron (Total)	6	1,640
Chloride	96	2,350
Sulfate	40	1,220
Organic Nitrogen	2.4	550
Ammonia Nitrogen	0.2	845
Conductivity	100	1,200
BOD	7,050	32,400
COD	800	50,700
Suspended Solids	13	26,500

* Gewsein, Allen J., USEPA: EPA/530/SE-137, March 1975

** Values are in milligrams per liter except pH (pH units) and conductivity (Micromhos per cubic centimeter).

C. The Installer’s warranty shall be against defects in the system installed for a period of two years from the date of final acceptance of the Work by the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND/OR GEOMEMBRANE INSTALLERS

A. Subject to compliance with the Contract Documents, the following manufacturers and installers are acceptable:
1. HDPE Geomembrane liners manufacturers::
   a. Agru/America, Inc.
   b. GSE, Inc.
   c. Poly-Flex Inc.
2. HDPE Geomembrane Liner Installers:
   a. Authorized installers of approved manufacturers.
   b. Other installers may qualify by providing references for a minimum of 10,000,000 SF of liner installations.

B. Submit requests for substitution in accordance with Specification Section 01640.

2.2 MATERIALS

A. HDPE Geomembrane Liners:
1. Geomembrane liners shall consist of unsupported polyethylene in thickness as shown on Drawings and manufactured from virgin, first quality resin designed and formulated specifically for liquid containment in hydraulic structures. Reclaimed polymer shall not be added to the resin; except use of polymer recycled during the manufacturing process shall be allowed provided that recycled polymer shall be clean and shall not exceed 2 percent by weight.
2. The geomembrane liner shall be manufactured to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. Any such defects shall be cause for rejection of the defective geomembrane material. Minor defects may be repaired in accordance with manufacturer's recommendations if this repair is approved by the Engineer.
3. The geomembrane liner shall be manufactured as seamless rolls or as prefabricated panels with a minimum width of 22 FT as delivered to the site. All factory seams shall be inspected and tested for strength and continuity prior to delivery to the site.
4. No additives or fillers may be added to the resin prior to or during manufacture of the geomembrane.
5. Prior to shipment, the geomembrane manufacturer will provide the Project Manager and the CQC Consultant with a quality control certificate for each roll of geomembrane provided. The quality control certificate will be signed by a responsible party employed by the geomembrane manufacturer and will include:
   a. Roll numbers and identification; and

b. The results of quality control tests performed under the MQC program.

6. The CQC Consultant will verify that a control certificate has been received for each roll and that the certified roll properties meet the requirements of these Specifications.

7. Textured HDPE sheet (both sides) shall be used on all lined areas.

8. The geomembrane liner material shall consist of **40 and 60 MIL NOMINAL HDPE** and meet or exceed GRI GM13 and the following requirements:

PROPERTY	TEST METHOD	TEST VALUE 40 MIL TEXTURED HDPE	 60 MIL TEXTURED HDPE
a. Sheet Thickness, Mils	ASTM D5994 or D5199 (for smooth)		
• Minimum Average		nominal ± 5%	nominal ± 5%
• Lowest Individual 8 of 10		nominal ± 10%	nominal ± 10%
• Lowest Individual 10 of 10		nominal ± 15%	nominal ± 15%
b. Sheet Density (g/cc)	ASTM D792 or D1505	0.94	0.94
c. Minimum Tensile Properties	ASTM D6693, Type IV, Dumb-bell at 2 imp. (each direction)		
• Yield Stress		84 ppi	130 ppi
• Break Stress		60 ppi	90 ppi
• Elongation at Yield		12%	12%
• Elongation at Break (2-inch gage length)		150%	150%
d. Min. Tear Resistance Initiation	ASTM D1004, Die C	28 lbs	42 lbs
e. Carbon Black	ASTM D1603 or ASTM D4218	2.0-3.0%	2.0-3.0%
f. Carbon Black Dispersion	ASTM D5596	Category	Category
• 8 of 10		1 or 2	1 or 2
• 10 of 10		1, 2, or 3	1, 2, or 3
g. Puncture Resistance, Minimum Average	ASTM D4833	60 lbs	90 lbs
h. Oxidative Induction Time, Minimum Average	ASTM D3895 or ASTM D5885	100 min. 400 min.	100 min. 400 min.
i. Asperity Height, Minimum Average	GRI GM12		7 mil

B. Extrusion rod shall be manufactured from identical resin to that used in geomembrane manufacture. Manufactured extrusion rod shall be tested for carbon black content and dispersion, specific gravity, and melt index at a frequency of not less than one test per batch.

2.3 INTERFACE FRICTION TESTS

A. Interface Friction Tests.

1. Test both materials using ASTM D 5321. Section 01060-Special Conditions, paragraph 1.16, outlines the conditions under which this material shall be tested.
2. This material is part of a system. The system shall meet the requirements before the component material can be deemed acceptable.

3. The costs associated with this testing shall be included in the bid price for each material. Any retesting or other additional testing required to meet the Specification shall be at no additional cost to the Owner.

2.4 EQUIPMENT

A. Welding Equipment: Extrusion welding equipment shall be provided with thermocouples and temperature readout devices which continuously monitor the temperature of the extrudate. Radiant wedge welding equipment shall be provided with thermocouples and temperature readout devices which continuously monitor the temperature of the wedge. Equipment shall be maintained in adequate number to avoid delaying work, and shall be supplied by a power source capable of providing constant voltage under a combined-line load. Use a rub sheet, sand bags, or other method approved by the CQA Consultant to separate the electric generators from the geomembrane.

B. Field Tensiometer: The Geomembrane Installer shall provide a tensiometer for on-site shear and peel testing of geomembrane seams. The tensiometer shall be in good working order, built to ASTM D638 (Type IV, 2 ipm) specifications, and accompanied by evidence of recent calibration. The tensiometer shall be motor driven and be equipped with a gauge that measures the force in unit pounds exerted between the jaws as displayed on a digital readout.

C. Vacuum Box: The Geomembrane Installer shall provide a minimum of 2 vacuum box assemblies consisting of a rigid housing, a transparent viewing window, a soft closed cell neoprene gasket attached to the bottom, a port hole or valve assembly, a vacuum gauge, a vacuum pump assembly equipped with a pressure control, a rubber pressure/vacuum hose with fittings and connections, and a soapy solution and an applicator. The equipment shall be capable of inducing and holding a minimum vacuum of 5 psi.

D. Air Pressure Test: The Geomembrane Installer shall provide the necessary air pump and fittings required to perform the GRI GM6 air pressure test on dual seams.

E. Roll Handling Equipment: The Geomembrane Installer shall provide handling equipment that is adequate and does not pose a risk to the geomembrane rolls. The CQC Consultant shall inspect the equipment and confirm its adequacy.

PART 3 - EXECUTION

3.1 LINER SYSTEM CONSTRUCTION

A. Geologic Buffer Layer:
1. The geologic buffer layer shall be constructed in accordance with Section 02275 and the Contractor shall protect the geologic buffer layer from freezing, desiccation, flooding with water, and freezing.
2. Prior to placement of the geomembrane, the geologic buffer layer must be prepared as follows:
    a. Lines and grade must be verified by a Licensed Land Surveyor.
    b. The surface must be proofrolled to verify the supporting soil condition.
    c. The surface must be inspected for rocks larger than 0.75 IN.
    d. Steel drum rolled in preparation for the geomembrane.
3. Geologic buffer layer acceptance: Geomembrane liner materials shall not be placed until the required geologic buffer layer preparation has been completed and the geologic buffer layer has been accepted and certified in writing by the Geomembrane Installer and approved by the CQA Engineer.

B. Geomembrane Liner:
1. The geomembrane liner shall be manufactured in accordance with the approved MQC program. The manufacturer shall not deviate from the program without written approval of the Engineer.
2. Transportation and handling of the geomembrane shall meet the following requirements:

   a. Transportation of the geomembrane is the responsibility of the Geomembrane Installer, Contractor, or other party as agreed upon.
   b. All handling on site is the responsibility of the Geomembrane Installer.
   c. The CQC Consultant will verify that the handling equipment used on the site is adequate and will not damage the geomembrane.
   d. Upon delivery to the site, the Geomembrane Installer and the CQC Consultant will conduct a surface examination of all rolls for defects or damage. This inspection will be conducted without unrolling rolls. The CQC Consultant will ensure that defective rolls are rejected and removed from the site.
   e. The Geomembrane Installer will be responsible for the storage of the geomembrane on site. The Project Manager will provide a storage location on site. The Geomembrane Installer shall ensure that the storage space is adequate to protect the geomembrane from theft, vandalism, vehicular damage, etc.
3. Field Panel Identification: The CQC Consultant will document that the Geomembrane Installer labels each field panel with an "identification code" consistent with the approved panel layout plan. The location of the label and the color of marker used must be as agreed to in the QA/QC Preconstruction Meeting.
4. Geomembrane Installation: Geomembrane liner shall be installed in accordance with the approved Geomembrane Installer's Field Installation Procedure Manual and panel layout drawing. The Geomembrane Installer shall maintain a weekly updated as-built drawing showing the location of all field panels.
   a. Geomembrane shall not be placed upon standing water or other conditions which will result in deterioration of the geologic buffer layer.
   b. The Geomembrane Installer shall remove any materials placed to protect the geologic buffer layer prior to placement of the geomembrane liner.
   c. Geomembrane liner shall be handled and placed in a manner which minimizes wrinkles, scratches, and crimps.
   d. Test seams shall be made upon each start of work for each seaming crew, upon every four hours of continuous seaming, every time seaming equipment is changed, or if significant changes in geomembrane temperature and weather conditions are observed. These test welds shall be tested using daily record that summarizes panels deployed, seams completed, seam testing, seam repair, personnel on site, and equipment on site using field tensiometer and, at a minimum, exhibit the required seam strength.
   e. Surfaces to be welded shall be clean and dry at the time of welding. Geomembrane shall not be welded when ambient temperatures are below 40 Deg F (5 Deg C) or above 104 Deg F (40 Deg C) unless the Geomembrane Installer can demonstrate that the seam quality is not compromised.
   f. Geomembrane liners shall be welded continuously without fishmouths or breaks in the weld. Where fishmouths are unavoidable, the geomembrane sheet shall be slit to a point such that the sheet lies flat and with no remaining wrinkle. The two edges of the slit shall be welded together provided that the overlap for this weld shall be a minimum of 3 IN. Areas of the slit which do not achieve an overlap of 3 IN, including the terminus of the slit, shall be provided with a patch as discussed below.
   g. Defects in and damage to geomembrane sheets shall be repaired by welding a patch over the defect using extrusion welding equipment. The patch material shall consist of an undamaged piece of geomembrane cut to provide a minimum of 3 IN of overlap in all directions from the defect. Torn or permanently twisted geomembrane shall be replaced at no expense to the Owner.
   h. Personnel walking on the geosynthetic shall not engage in activities or wear types of shoes, that could damage the geosynthetic. Smoking shall not be permitted while working on the geomembrane.
   i. Vehicular traffic directly on the geosynthetic shall not be permitted. Equipment shall not damage the geosynthetic materials by handling, trafficking, leakage of hydrocarbons, or any other means. The unprotected geomembrane surface shall not be used as a work area, for preparing patches, storing tools and supplies, or other uses.

5. Geomembrane Testing (Nondestructive): The Geomembrane Installer shall test and document all seam welds continuously using one of the following nondestructive seam tests:
   a. Vacuum testing shall conform to the following procedure: Brush soapy solution on geomembrane. Place vacuum box over the wetted seam area. Ensure that a leak-tight seal is created. Apply a pressure of approximately five (5) psi. Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 15 seconds. All areas where soap bubbles appear shall be marked and repaired as described in this Section.
   b. Air Pressure Testing (for double seam with an enclosed space) shall conform to GRI GM6 requirements.
6. Destructive Testing: The Geomembrane Installer shall field test seams destructively at a minimum frequency of one test per 500 LF of weld. Destructive testing of these samples shall also be performed by the CQC Consultant using the CQC Geosynthetics Laboratory. The CQC Consultant shall determine the location of destructive test samples. Conformance testing will be performed by the CQA Consultant in accordance with the project CQA Plan.
   a. The destructive sample shall be 16 IN wide by 42 IN long with the seam centered lengthwise. The sample shall be cut into three (3) equal parts for distribution to the geomembrane installer, the Owner, and the CQC Consultant.
   b. All seam tests (fusion and extrusion) shall exhibit a Film Tearing Bond type of separation in which the geomembrane material tears before the weld. At least 5 coupons shall be tested by each test method. Five of five coupons shall meet minimum requirements, as specified below:

Description	Test Method	Value (lbs/in width)
60 MIL		
HDPE Peel	ASTM D4437	90 78 for extrusion
HDPE Shear	ASTM D4437	120
40 MIL		
HDPE Peel	ASTM D4437	65 52 for extrusion
HDPE Shear	ASTM D4437	80

7. Documentation: The following documentation must be maintained at the project site for review by the Project Manager or CQA Consultant:
   a. Geomembrane Installer's Documentation:
      1) Daily Log: daily record that summarizes panels deployed, seams completed, seam testing, seam repair, personnel on site, and equipment on site.
      2) Panel Log: provides geomembrane roll number used and subgrade acceptance for each panel deployed.
      3) Seam Testing Log: provides a complete record of all nondestructive and destructive seam tests performed as part of the Geomembrane Installer's QC program.
      4) Seam/Panel Repair Log: provides a complete record of all repairs and vacuum box testing of repairs made to defective seams or panels.
      5) As-Built Drawing: maintain an as-built drawing updated on a weekly basis.
   b. CQC Consultant's Documentation:
      1) Daily Log: daily record that summarizes panels deployed, seams completed, CQC seam testing, seam repair, personnel on site, equipment on site, weather conditions, etc.

2) CQC Testing Log: record of all seam destructive tests and material conformance tests performed by the CQC Geosynthetics Laboratory.

3) Material Conformance: maintain original conformance certificate(s) from geomembrane manufacturer.

4) Subgrade Acceptance Log: maintained originals of subgrade acceptance forms for each panel and signed by the Geomembrane Installer.

3.2 GEOMEMBRANE ACCEPTANCE

A. The Geomembrane Installer shall retain all Ownership and responsibility for the geomembrane liner system until final acceptance by the Owner. Owner will accept the geosynthetic installation when the installation is finished and all required submittals from the Geomembrane Installer and CQC Consultant have been received and approved, and CQA verification of the adequacy of all field seams and repairs, including associated testing, is complete.

END OF SECTION

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SECTION 02800

GEOSYNTHETIC CLAY LINER (GCL)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Furnish all labor, material, and equipment to complete installation of the GCL in accordance with the Contract Drawings and these Specifications.
  2. Completely coordinate work with that of other trades.
  3. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.
  4. Furnish CQC Consultant to monitor the work of GCL Installer and to perform CQC testing in accordance with provisions of the Contract Documents.

B. Related Sections include but are not necessarily limited to:
  1. Section 02220 - Earthwork.
  2. Section 02775 - HDPE Geomembrane Liner.

1.2 QUALITY STANDARDS

A. Referenced Standards:
  1. American Society for Testing and Materials (ASTM).
     a. ASTM D4632, Test Method for Grab Breaking Load and Elongation of Geotextile.
     b. ASTM D4643, Determination of Water Content of Soil by Microwave Oven Method.
     c. ASTM D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
     d. ASTM D5084, Test Method for Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
     e. ASTM D5261, Measuring Mass Per Unit Area of Geotextiles.
     f. ASTM D5321, Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
     g. ASTM D5887, Measurement of Index Flux through Saturated GCL Specimens Using a Flexible Wall Permeameter.
     h. ASTM D5888, Storage and Handling of GCL.
     i. ASTM D5889, Quality Control of GCL.
     j. ASTM D5890, Swell Index Measurement of Clay Mineral Component of GCL.
     k. ASTM D5891, Fluid Loss of Clay Mineral Component of GCL.
     l. ASTM D5993, Measuring Mass Per Unit Area of GCL.
     m. ASTM D6072, Installation of GCL.
  2. Geosynthetic Research Institute (GRI):
     a. GCL-2, Permeability of Geosynthetic Clay Liners.

B. Qualifications:
  1. Manufacturer: The GCL shall be furnished by a manufacturer that has previously produced a minimum of 1,000,000 SF of the material for use in similar projects.

C. CQA Plan Implementation: Construction Quality Assurance documentation for the GCL installation will be performed for the Owner by the CQA Consultant in accordance with the CQA Plan prepared for this project. The work performed under the CQA Plan is paid for by the Owner and is not a part of this contract. The Contractor, CQC Consultant, and GCL Installer, however, should familiarize themselves with the CQA Plan and are responsible for providing reasonable notice of and access to work elements that the CQA Consultant is required by the CQA Plan to overview.

1.3 DEFINITIONS

A. Manufacturer: Manufacturer produces geosynthetic clay liner panels from first quality geotextiles and sodium bentonite. The manufacturer is responsible for producing panels which comply with this Specification. These responsibilities include but are not limited to:

1. Acceptance of the geotextiles, bentonite, and additives from suppliers/manufacturers and testing of these materials to ensure compliance with the manufacturer's specifications and with this Specification.
2. Fabrication of the geotextiles and bentonite into GCL panels using mixing and extrusion equipment.
3. Testing of the GCL to ensure compliance with manufacturer's specification and this Specification.
4. Shipping of the GCL to fabricator/installer designated facilities.
5. Certification of the raw materials and finished GCL to comply with this Specification.
6. Certification of fabricator's and installer's training, experience, and methods for seaming and inspecting GCL installations in compliance with manufacturer's standards and with Quality Assurance requirements of this Specification (Article 1.2).

B. Installer: Installers of GCLs are responsible for storing, handling, fitting, seaming, and testing of GCL panels in the field. These responsibilities include but are not limited to:

1. Acceptance (in writing) of the GCL rolls from the transporter.
2. Acceptance (in writing) of the soil material which will serve as a base for the GCL. This acceptance shall precede installation of the GCL, and shall state that the installer has inspected the surface, and reviewed the Specifications for material and placement, and finds all conditions acceptable for placement of GCL liners. The written acceptance shall explicitly state any and all exceptions to acceptance.
3. Handling, seaming, testing, and repair of GCL liners in compliance with this Specification and with written procedure manuals prepared by the installer or the manufacturer.
4. Repair or replacement of defects in the GCL as required by the Inspector or the Owner.
5. Installer and manufacturer may be the same firm.

C. Inspector: Inspectors of GCL liner are responsible for observing field installation of the GCL and providing the manufacturer, installer, and Owner with verbal and written documentation of the compliance of the installation with this Specification and with written procedures manuals prepared by the manufacturer. Inspector’s responsibilities include, but are not limited to:

1. Inspection of material, handling, and field installation of the GCL liner. Inspection of all seams, repair, and test results.
2. All exceptions to material or installation shall be documented to the Engineer in writing within 48 hours of discovery.

D. Engineer: The Engineer is responsible for design of the geosynthetic liner system.

E. Owner: Owner designates the party responsible for constructing and operating the lined containment system.

1.4 SUBMITTALS

A. Pre-Installation: The Contractor shall submit the following information and material to the CQA Consultant prior to installation of the GCL.

1. Product Data and Factory Test Results: Published product properties and specifications for the proposed GCL, as well as factory test results of materials certified by the GCL manufacturer, shall be submitted showing conformance with the requirements of these Specifications. In addition, the Contractor shall submit the manufacturer's certification stating that the material is similar to and of the same formulation as that for which test results are submitted, and by which actual usage has been demonstrated to be satisfactory for the intended application.
2. Samples: Samples of the GCL sheeting shall be provided to the CQA Consultant. Samples shall have a width of 4.5 IN, and a length of 5 IN.
3. Delivery, Storage, and Handling Instructions: The manufacturer's recommendations for delivery, storage, and handling shall be submitted to the CQA Consultant for review.
4. Delivery Date: The CQA Consultant shall be notified of the scheduled delivery date for the materials.
5. Installation Drawings, Procedures, and Schedules: Installation drawings, procedures, and a schedule for carrying out the work shall be provided by the Contractor to the CQA Consultant for review. Procedures addressed by the Contractor shall include but not be limited to material unloading, storage, installation, repair, and protection to be provided in the event of rain. A schedule showing the order of placement, location of panels, seams, and penetrations shall be submitted for the CQA Consultant's review. Submit drawings showing the panel layout, seams, and associated details including pipe penetrations. Following review, these drawings will be used for installation of the GCL. Any deviations from these drawings must be approved by the CQA Consultant.

B. Post-Installation: Upon completion of GCL installation, the Contractor shall submit the following to the CQA Consultant:
   1. A certificate stating that the GCL has been installed in accordance with the Plans, Specifications, and the manufacturer's recommendations.
   2. Manufacturer's Warranty: The material warranty shall be for defects or failures related to manufacture on a non-prorata basis for five (5) years after date of shipment.
   3. GCL Installer's Warranty: The GCL Installer's warranty shall warrant their workmanship to be free of defects on a non-prorata basis for five (5) years after the final acceptance of the Work. This warranty shall include but not be limited to overlapped seams, anchor trenches, attachments to appurtenances, and penetration seals.
   4. Record Drawing Information: Record drawings including but not limited to drawings showing the location of all seams, panels, repairs, patches, anchor trenches, pipe penetrations, and other appurtenances, including measurements and dimensions, shall be prepared by the Contractor and submitted to the CQA Consultant following completion of the project.

1.5 PROJECT CONDITIONS

A. The GCL shall not be placed in standing water, high humidity, or while raining. Any material that becomes partially or completely hydrated in the opinion of the CQA Consultant shall be removed and replaced at Contractor's expense.

B. Take necessary precautions to protect underlying soil and geomembrane liners from damage due to any construction activity. Damage to liners shall be repaired at Contractor’s expense.

C. The Contractor shall ensure that adequate dust control methods are in effect to prevent the unnecessary accumulation of dust and dirt on geosynthetic surfaces, which hampers the efficient field seaming of geosynthetic panels.

D. The Contractor shall maintain natural surface water drainage diversions around the work area. The Contractor shall provide for the disposal of water that may collect in the work area, from precipitation falling on the work or from inadequate diversion structures.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. The GCL shall consist of bentonite encased, front and back, with geotextile. GCL consisting of bentonite backed with geomembrane can be used only if approved by the Project Manager and Engineer. The materials supplied under these Specifications shall be first quality products designed and manufactured specifically for the purposes of this work.
2. The GCL shall be supplied in rolls which have a minimum width of 12 FT. The roll length shall be maximized to provide the largest manageable sheet for the fewest overlaps. Labels on the roll shall identify the sheet number, date of fabrication, proper direction of unrolling, and minimum recommended overlap. A quality control certificate shall be supplied with each roll.
3. **The GCL shall be reinforced.**
4. The bentonite shall be continuously adhered to both geotextiles to ensure that the bentonite will not be displaced during handling, transportation, storage and installation, including cutting, patching, and fitting around penetrations. The bentonite sealing compound or bentonite granules used to seal penetrations and make repairs shall be made of the same natural sodium bentonite as the GCL and shall be as recommended by the GCL manufacturer. The permeability of the GCL overlap seams shall be equal to or less than the permeability of the body of the GCL sheet.

B. Physical Properties: Physical properties of GCL shall be as shown in Table 1 of this Section. The manufacturer shall certify that materials provided meet these criteria according to ASTM D5889 as modified by this Specification.

TABLE 1: REQUIRED GCL PROPERTIES

GCL PROPERTY	TEST METHOD	VALUE REINFORCED
Maximum Hydraulic Conductivity	ASTM D5084 (@ 30 psi effective stress)	5x10^{-9} cm/s
Minimum Bentonite Content	ASTM D5993 (@ 0% moisture)	0.75 lb/sf
Minimum Grab Tensile Strength	ASTM D4632	90 lbs
Minimum Puncture Resistance	ASTM D4833	80 lbs
Average Minimum Shear Strength	ASTM D5321	500 psf (when hydrated)
Minimum Free Swell	ASTM D5890	24 mL
Maximum Fluid Loss	ASTM D5891	18 mL
Maximum Moisture Content (per roll)	ASTM D4643	100%

C. Interface Friction Tests.

1. Test this and adjacent materials using ASTM D 5321. Section 01060 Special Conditions paragraph 1.16outlines the conditions under which this material shall be tested.

2. This material is part of a system. The system shall meet the requirements before the component material can be deemed acceptable.
3. The costs associated with this testing shall be included in the Bid price for each material. Any retesting or other additional testing required to meet the specification shall be at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Shipping, Handling, and Storage:
   1. During periods of shipment and storage, all GCL shall be protected from direct sunlight, water, mud, dirt, dust, and debris. To the extent possible, the GCL shall be maintained wrapped in heavy-duty protective covering until use. GCL delivered to the project site without protective wrapping shall be rejected.
   2. The Engineer shall approve the shipping and delivery schedule prior to shipment. The Engineer shall approve the on-site storage area for the GCL. Unloading and storage of GCL shall be the responsibility of the Contractor.
   3. GCL that is damaged during shipping, handling, or storage shall be rejected and replaced at Contractor’s expense.

B. Installation of GCL:
   1. GCL shall be placed to the lines and grades shown on the Contract Drawings. At the time of installation, GCL shall be rejected by the CQA Consultant if it has defects, rips, holes, flaws, evidence of deterioration, or other damage.
   2. The surface receiving the GCL shall be prepared to a relatively smooth condition, free of obstructions, excessive depressions, debris, and very soft or loose pockets of soil. This surface shall be approved by the CQA Consultant prior to GCL placement.
   3. The GCL shall be placed smooth and free of excessive wrinkles.
   4. The GCL shall be installed on sideslopes with vertical seams only.
   5. When GCL is placed with upslope and downslope portions, the upslope portion shall be lapped such that it is the upper or exposed surface.
   6. The GCL shall not be placed in standing water or while raining. Any material that becomes partially/totally hydrated shall be removed and replaced.
   7. The GCL seams shall be laid with a minimum overlap equal to 6 IN or the manufacturer's recommendation, whichever is greater. Bentonite powder shall be placed at all GCL seams.
   8. GCL shall be temporarily secured in a manner approved by the CQA Consultant prior to placement of overlying materials.
   9. Any GCL that is torn or punctured shall be repaired or replaced as directed by the CQA Consultant, by the Contractor at no additional cost to the Owner. The repair shall consist of a patch of GCL placed over the failed areas and shall overlap the existing GCL a minimum of 12 IN from any point of the rupture.
   10. If in-place GCL is not otherwise protected from hydration due to rainfall, the GCL shall be covered with a minimum of 12 IN of the overlying design material within 12 hours of GCL placement.

3.2 FIELD QUALITY CONTROL

A. The CQA Consultant shall monitor and document the installation of GCL to ensure that the installation and necessary repairs are made in accordance with these Specifications.

3.3 GCL ACCEPTANCE

A. The GCL Installer shall retain all ownership and responsibility for the GCL until final acceptance by the Owner. The Owner will accept the GCL installation when the installation is finished, all required submittals have been received and approved, and CQC/CQA verification of the adequacy of all field seams and repairs, including associated testing, is complete.

END OF SECTION

SECTION 02900
GEOTEXTILE FABRIC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Geotextile fabric for all uses as shown in Drawings including but not limited to:
    a. Geocomposite drainage media.
    b. Separator geotextile.
    c. Roadbed geotextile.

B. Related Sections include but are not necessarily limited to:
  1. Section 02220 - Earthwork.
  2. Section 02775 – High-Density Polyethylene (HDPE) Membrane Liner.
  3. Section 02999 - Geocomposite Drainage Media.

1.2 QUALITY STANDARDS

A. Reference Standards:
  1. American Society for Testing and Materials (ASTM):
    a. D1987, Biological Clogging of Geotextile or Soil/Geotextile Filters.
    b. D3776, Test Method for Mass Per Unit Area of Woven Fabric.
    c. D4354, Practice for Sampling of Geosynthetics for Testing.
    d. D4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water.
    e. D4491, Test Method for Water Permeability of Geotextiles by Permittivity.
    f. D4595, Tensile Properties of Geotextiles by the Wide-Width Strip Method.
    g. D4632, Test Method for Grab Breaking Load and Elongation.
    h. D4751, Determining Apparent Opening Size of a Geotextile.
    i. D4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembrane, and Related Products.
    j. D4873, Guide for Identification, Storage, and Handling of Geotextiles.
    k. D5261, Measuring Mass Per Unit Acre of Geotextiles.

B. Construction Quality Assurance Plan.

1.3 SUBMITTALS

A. Shop Drawings:
  1. See Section 01340.
  2. Product technical data.
  3. Manufacturer's delivery, storage, handling, and installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
  1. Geotextiles:
    a. Amoco Fabrics and Fibers Co.
    b. Advanced Drainage Systems Inc.
    c. Nicolon Mirafi Group.

- d. Synthetic Industries, Inc.
- e. Or approved equal.

2.2 FABRICATION

A. Separator Geotextile: Non-woven, needle punched; polypropylene; continuous filament or staple fibers; conforming to the following properties:

Property	Test Method	Minimum Required Value
Unit Weight	ASTM D5261	8 oz/sy
Grab Tensile Strength	ASTM D4632	210 lb
Elongation	ASTM D4632	50%
Puncture Strength	ASTM D4833	95 lb
Maximum Apparent Opening Size	ASTM D4751	#70 US Sieve
Permittivity	ASTM D4491	0.5 sec-1

B. Roadbed Geotextile Fabric: The geotextile shall be composed of synthetic fibers formed into a woven fabric. Fibers used in the manufacture of the geotextile shall be polyolefins, polyethylene or polyamides and conform to the following properties.

Property	Test Method	Minimum Required Value
Grab Tensile	ASTM D4632	200 lbs
Grab Elongation	ASTM D4632	15 %
Puncture Strength	ASTM D4833	100 lbs
Trapezoidal Tear	ASTM D4533	75
UV Resistance	ASTM D4355	90 %

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Handling and Layout
1. General storage and handling of geotextiles must meet requirements of ASTM D4873.
2. Exercise care when installing to prevent damage to geotextile.
3. Lay out geotextile smooth and free of wrinkles, but loose enough that placement of overlying materials will not stretch or tear the fabric.
4. Repair or replace geotextile that is torn or punctured. Repair by placing a geotextile patch over the damaged area, overlapping the existing geotextile by 12 IN (minimum) from any part of the damaged area. Repair or replace at no extra cost to Owner.
5. No equipment may operate directly on geotextiles. A minimum vertical separation of 9 IN must be maintained between all geotextiles and equipment tracks or wheels.

B. Seaming and Joining
1. Separator: Join sheets as specified below.
   - a. With Sewing: Overlap adjacent panels a minimum of 4 IN. Use Type SSa (prayer) seam and a Type 401 stitch having a minimum distance from the edge of the geotextile to the stitch line of 2.0 IN or follow recommendations of geotextile manufacturer.
   - b. With Heat Bonding: Overlap adjacent panels a minimum of 4 IN. Heat bond seam must develop a minimum of 60% of the tensile strength of the parent geotextile as measured in ASTM D4632.

C. Separator Geotextile
   1. Place fabric directly on a relatively smooth subgrade, free of obstructions, abrupt depressions or humps, debris, or deposits of loose or soft soil.
   2. Care must be taken to avoid damaging the geotextile during placement of the soil over the geotextile. This may require use of a thicker loose lift or a smooth drum roller to limit damage due to penetration of compactor feet.

D. Roadbed Geotextile Fabric: Woven
   1. Place woven geotextile directly on a relatively smooth subgrade, free of obstructions, abrupt depressions or humps, debris, or deposits of loose or soft soil.
   2. If required, the geotextile may be held in place with staples.
   3. Geotextile shall be overlapped in the direction of the subbase placement.

3.2 CQC TESTING

A. The CQAConsultant shall confirm that the identification, storage, and handling of geotextiles is in accordance with ASTM D4873. Any deviation from this requirement will be reported to the Engineer.

B. The CQA Consultant will examine all manufacturer's certifications to ensure that the property values listed on the certifications meet or exceed these specifications. Any deviations will be reported to the Engineer.

C. The CQA Consultant will observe placement of the geotextiles to confirm that the panel overlaps and seams are in accordance with these specifications. Any deviations will be reported to the Engineer.

END OF SECTION

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SECTION 02999

GEOCOMPOSITE DRAINAGE MEDIA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Geocomposite drain for all uses as shown in Drawings including but not limited to:
    - a. Drainage layer for final cover system.
    - b. Cell underdrain.
    - c. Leachate collection layer..
- B. Related Sections include but are not necessarily limited to:
  - 1. Division 1 - General Requirements.
  - 2. Section 02220 - Earthwork.
  - 3. Section 02775 – High-Density Polyethylene (HDPE) Membrane Liner.
  - 4. Section 02900 - Geotextile Fabric.
  - 5. Construction Quality Assurance/Quality Control Plan.

1.2 QUALITY STANDARDS

- A. Reference Standards:
  - 1. American Society for Testing and Materials (ASTM):
    - a. ASTM D413 Standard Test Method for Rubber Property – Adhesion to Flexible Substrate.
    - b. ASTM D792, Standard Test Methods for Density and Specific Gravity of Plastic by Displacement.
    - c. ASTM D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.
    - d. ASTM D4716, Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
    - e. ASTM D5199, Standard Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
  - 2. Geosynthetic Research Institute (GRI):
    - a. GRI-GC7, Determination of adhesion and bond strength of geocomposites.
    - b. GRI-GC8, Determination of the allowable flow rate of a drainage geocomposite.

1.3 SUBMITTALS

- A. Shop Drawings:
  - 1. See Sections 01300 and 01340.
  - 2. Product technical data.
  - 3. Manufacturer's delivery, storage, handling, and installation instructions.
  - 4. Certification with test results that the material shall meet the material properties.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  - 1. Tenax Corp.
  - 2. GSE.
  - 3. SKAPS Industries.

4. Approved equal.

2.2 MATERIALS

A. The geocomposite shall be formed by thermally bonding a nonwoven geotextile to both faces of a geonet. Heat bonding shall be performed by the manufacturer prior to shipping to the site.

B. The geonet shall be manufactured by extruding multiple sets of polyethylene strands to form a three-dimensional structure to provide planer water flow.

C. The geotextile shall be 8 oz/sq.yd. nonwoven that meets the separator geotextile requirements of Section 02900 of these Specifications.

D. The material shall have the following minimum properties:

Property	Test Method	Minimum Value
Geotextile Adhesion	GRI GC7	1 lb/IN
Geonet Thickness	ASTM D5199	0.250 IN
Geonet Resin Density	ASTM D1505 or D792	0.94 g/cc
Average Geocomposite Transmissivity	ASTM D4716	6.5E-4 m^2/sec* @ 100 hrs

* Conduct transmissivity test at a normal compressive load of 10,000 psf and a hydraulic gradient of 0.3. Boundary conditions are soil interface on the upper geotextile and HDPE geomembrane against the lower geotextile. Test report shall include results for 1 hour, 24 hours, 48 hours, and 100 hours of loading.

E. Each roll of geocomposite drainage media shall have the following identification information attached:
1. Manufacturer's name.
2. Product identification.
3. Thickness (geonet only).
4. Roll number.
5. Lot number.
6. Roll dimensions.

F. The manufactured rolls of geocomposite drain shall be wrapped or otherwise protected against moisture, dust, and dirt during shipping and storage. Geocomposite drainage media damaged during shipping or storage shall be replaced at Contractor's expense.

G. Interface Friction Tests.
1. Test materials using ASTM D 5321. Section 01060-Special Conditions, paragraph 1.16, outlines the conditions under which this material shall be tested.
2. This material is part of a system. The system shall meet the requirements before the component material can be deemed acceptable.
3. The costs associated with this testing shall be included in the Bid price for each material. Any retesting or other additional testing required to meet the Specification shall be at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install geocomposite drain in accordance with manufacturer’s written recommendations.

B. Geocomposite drainage media shall be placed where shown on the Contract Drawings.

C. The geocomposite drainage media shall be placed only on geomembrane that has been approved by the Geomembrane Installer and accepted by the CQA Consultant.

D. The Contractor shall provide temporary anchorage of the geocomposite drainage media at the top of the landfill during installation to prevent movement during construction. Permanent bonding to the geomembrane is prohibited.

E. Adjacent rolls of geonet shall be overlapped at a distance of at least 3 IN and secured using polyethylene ties placed every 5 FT. These ties shall be spaced every 5 FT along the roll length and every 1 FT across the roll width, and every 6 IN in the anchor trench, or as otherwise specified by the Engineer. The top geotextile shall be sewn together along all roll edges.

F. Any geocomposite drainage media that is torn, crushed, or punctured shall be repaired or replaced by the Contractor at no additional cost to the Owner. The repair shall consist of a patch of the same geocomposite drainage media placed over the damaged area and overlapped a minimum of 12 IN from any point of damage. The patch shall be attached to the geonet using polyethylene ties placed at least every 5 FT.

G. All soils placed over the composite drainage media shall be placed in such a manner as to ensure:
   1. The geocomposite drainage media and the underlying geomembranes are not damaged in anyway.
   2. Minimal slippage of the geocomposite drainage media on the underlying geomembrane occurs.
   3. No excess tensile stresses occur in the geocomposite drainage media.

3.2 QUALITY CONTROL

A. Prior to installation to the geocomposite drainage media, the Contractor shall provide quality control certificates signed by the manufacturer's quality assurance manager for every 100,000 SF of geocomposite drainage media to be installed.

END OF SECTION

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SECTION 03002
CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete and grout.
   2. Concrete mixes, proportioning, and source quality control for precast concrete.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Concrete Institute (ACI):
      a. 116R, Cement and Concrete Terminology.
      b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      c. 212.3R, Chemical Admixtures for Concrete.
      d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
      e. 304.2R, Placing Concrete by Pumping Methods.
      f. 305R, Hot Weather Concreting.
      g. 306R, Cold Weather Concreting.
      h. 318, Building Code Requirements for Structural Concrete.
      i. 347R, Recommended Practice for Concrete Formwork.
   2. American Society for Testing and Materials (ASTM):
      a. A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
      b. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (Including Supplementary Requirements S1).
      c. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
      d. C33, Standard Specification for Concrete Aggregates.
      e. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      f. C94, Standard Specification for Ready-Mixed Concrete.
      g. C138, Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
      h. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
      i. C150, Standard Specification for Portland Cement.
      j. C157, Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete.
      k. C171, Standard Specification for Sheet Materials for Curing Concrete.
      l. C172, Standard Practice for Sampling Freshly Mixed Concrete.
      m. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
      n. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
      o. C260, Standard Specification for Air Entraining Admixtures for Concrete.
      p. C289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
      q. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

        r. C494, Standard Specification for Chemical Admixtures for Concrete.
        s. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
        t. D994, Standard Specification for Preformed Expansion Joint Filler for Bituminous Concrete.
        u. D1056, Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
        v. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
        w. E329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
    3. Federal Specification (FS):
        a. CEGS 03300, Vegetable Fiber.
    4. Virginia Uniform Statewide Building Code, current edition.

B. Quality Control:
    1. Concrete testing agency.
        a. Contractor to employ and pay for services of an independent testing laboratory to:
            1) Perform materials evaluation.
            2) Perform retests due to initial failing tests.
        b. See 3.4 “Field Quality Control” for Owner employment of testing laboratory.
        c. Concrete testing agency to meet requirements of ASTM E329 and be approved by Engineer.
    2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
        a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
    3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
        a. Do not use revised concrete mixes until submitted to and approved by Engineer.
    4. Contractor shall perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.

C. Qualifications:
    1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).
    2. Formwork, shoring and reshoring for walls, slabs and beams except where cast on ground to be designed by a professional engineer currently registered in the state where the project is located.

1.3 DEFINITIONS

A. Per ACI 116R except as modified herein:
    1. Concrete fill: Non-structural concrete.
    2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
    3. Exposed concrete: Exposed to view after construction is complete.
    4. Indicated: Indicated by Contract Documents.
    5. Lean concrete: Concrete with low cement content.
    6. Nonexposed concrete: Not exposed to view after construction is complete.
    7. Required: Required by Contract Documents.
    8. Specified strength: Specified compressive strength at 28 days.
    9. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

A. Shop Drawings:
  1. See Section 01340 and/or 01300.
  2. Concrete mix designs proposed for use. Concrete mix design submittal to include:
    a. Sieve analysis and source of fine and coarse aggregates.
    b. Test for aggregate organic impurities.
    c. Test for deleterious aggregate per ASTM C289.
    d. Proportioning of all materials.
    e. Type of cement with mill certificate for cement.
    f. Type of fly ash with certificate of conformance to specification requirements.
    g. Slump.
    h. Air content.
    i. Brand, type, ASTM designation, and quantity of each admixture proposed for use.
    j. 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
    k. Standard deviation value for concrete production facility.
  3. Manufacturer and type of joint filler, joint sealant, curing agent and water stop.
  4. Manufacturer and type of bonding and patching mortar and bonding adhesive used at construction joints.
  5. Manufacturer and type of nonshrink grout.
  6. Reinforcing steel: Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
    a. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
    b. Obtain approval of shop drawings by Engineer before fabrication.
    c. Mill certificates.
  7. Strength test results of newly placed concrete, including slump, air content and concrete temperature.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:
  1. Cement and fly ash:
    a. Store in moistureproof, weathertight enclosures.
    b. Do not use if caked or lumpy.
  2. Aggregate:
    a. Store to prevent segregation and contamination with other sizes or foreign materials.
    b. Obtain samples for testing from aggregates at point of batching.
    c. Do not use frozen or partially frozen aggregates.
    d. Do not use bottom 6 IN of stockpiles in contact with ground.
    e. Allow sand to drain until moisture content is uniform prior to use.
  3. Admixtures:
    a. Protect from contamination, evaporation, freezing, or damage.
    b. Maintain within temperature range recommended by manufacturer.
    c. Completely mix solutions and suspensions prior to use.
  4. Reinforcing steel:
    a. Support and store all rebars above ground.

B. Delivery:
  1. Concrete:
    a. Prepare a delivery ticket for each load for ready-mixed concrete.
    b. Truck operator shall hand ticket to Construction Administrator or Laboratory Technician at the time of delivery.
    c. Ticket to show:
      1) Mix identification mark.
      2) Quantity delivered.

        3) Amount of each material in batch.
        4) Outdoor temp in the shade.
        5) Time at which cement was added.
        6) Numerical sequence of the delivery.
        7) Approved amount of water (if any) added.
    2. Reinforcing steel: Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
        a. Mark numbers to match shop drawing mark number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
    1. Nonshrink, nonmetallic grout:
        a. Sika "SikaGrout 212."
        b. Gifford Hill "Supreme Grout."
        c. Master Builders "Masterflow 713."
    2. Epoxy grout:
        a. Master Builders "Brutem MPG."
        b. Euclid Chemical Company, "High Strength Grout."
        c. Fosroc, "Conbextra EPHF".
    3. Expansion joint fillers:
        a. Permaglaze Co.
        b. Rubatex Corp.
        c. Williams Products, Inc.
    4. Waterstops, Preformed – Strip Type:
        a. Manufacturers:
            1) Greenstreak (Hydrotite).
            2) Adeka Ultra Seal (MC-2010M).
            3) De Neef (Swellseal Plus).
            4) Colloid Environmental Technology (Akwastop).
        b. Nonbentonite composition, hydrophilic.
        c. Solid cross section around pipe penetration.
        d. Hollow cross section at construction joints.
        e. Manufactured solely for the purpose of preventing water from traveling through construction joints.
    5. Waterstops, PVC:
        a. Greenstreak Plastic Products, Inc.
        b. W.R. Meadows, Inc.
        c. Burke Company.
    6. Form coating:
        a. Richmond "Rich Cote."
        b. Industrial Lubricants "Nox-Crete Form Coating."
        c. Protex "Pro-Cote."
    7. Prefabricated forms:
        a. Simplex "Industrial Steel Frame Forms."
        b. Symons "Steel Ply."
        c. Universal "Uniform."
    8. Synthetic fibers:
        a. Fibermesh.
        b. Grace Construction Products.
        c. Or approved equal.

2.2 MATERIALS

A. Portland Cement: Conform to ASTM C150 Type II.

B. Fly Ash:
   1. ASTM C618, Class F.
   2. Nonstaining.
      a. Hardened concrete containing fly ash to be uniform light gray color.
   3. Maximum loss on ignition: 4 percent.
   4. Compatible with other concrete ingredients.
   5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in bridge concrete.

C. Admixtures:
   1. Air entraining admixtures: ASTM C260.
   2. Water reducing, retarding, and accelerating admixtures:
      a. ASTM C494 Type A through E.
      b. Conform to provisions of ACI 212.3R.
      c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
      d. Follow manufacturer's instructions.
      e. Use chloride free admixtures only.
   3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:
      a. 0.10 all concrete.
   4. Do not use calcium chloride.
   5. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.

D. Water: Potable, clean, free of oils, acids and organic matter.

E. Aggregates:
   1. Normal weight concrete: ASTM C33, except as modified below.
   2. Fine aggregate: Clean natural sand.
      a. No manufactured or artificial sand.
   3. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material.
      a. Maximum amount of clay or shale particles: 1 percent.
   4. Gradation of coarse aggregate:
      a. All concrete: Size #57.

F. Concrete Grout:
   1. Nonshrink nonmetallic grout:
      a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
      b. Grout to produce a positive but controlled expansion.
      c. Mass expansion not to be created by gas liberation.
      d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
   2. Epoxy grout:
      a. 3-component epoxy resin system.
         1) Two liquid epoxy components.
         2) One inert aggregate filler component.
      b. Each component packaged separately for mixing at jobsite.

G. Reinforcing Steel:
   1. Reinforcing bars: ASTM A615, Grade 60.

H. Forms:
   1. Prefabricated or job built.
   2. Wood forms:

        a. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
        b. Built-in-place or prefabricated type panel.
        c. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire area.
        d. When approved, plywood may be reused.
    3. Metal forms:
        a. Metal forms excluding aluminum may be used.
        b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
    4. Chamfer strips: Clear white pine, surface against concrete planed.
    5. Form ties: Removable end, permanently embedded body type with integral waterstop and cones on outer ends not requiring auxiliary spreaders.
        a. Cone diameter: 3/4 IN minimum to 1 IN maximum.
        b. Embedded portion 1 IN minimum back from concrete face.
        c. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.
    6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

I. Waterstops, Pre-formed – Strip Type:
    1. Lap all types of waterstop to create water tight joints.
    2. Install on smooth surface of hardened concrete by use of nails, adhesive or other means as recommended by manufacturer to prevent movement of waterstop during placement of new concrete.
    3. Roughened joints shall be especially prepared during concrete placement to provide narrow, smooth surface for proper waterstop installation.
        a. Fill low areas under strip waterstops with a water swelling sealant recommended by waterstop manufacturer.
    4. Waterstop to be continuous with splices in accordance with manufacturer’s instructions.
    5. Unless otherwise noted, use in joints against existing concrete and where indicated on Drawings.

J. Waterstops, PVC:
    1. Plastic: Corp of Engineers Specifications CRD-C572.
    2. Serrated with center bulb.
    3. Thickness: 3/8 IN.
    4. Length (general use): 6 IN unless indicated otherwise.
    5. Expansion joints:
        a. Length: 9 IN.
        b. Center bulb: 1 IN OD x ½ IN ID.
    6. Provide hog ring or grommets spaced at maximum 12 IN OC along the length of the water stop.
    7. Provide factory made waterstop fabrications at all changes of direction, intersections and transitions leaving only straight butt splices for the field.

K. Chairs, Runners, Bolsters, Spacers, and Hangers:
    1. Stainless steel, epoxy coated, or plastic coated metal.
        a. Plastic coated rebar support tips in contact with the forms only.

L. Membrane Curing Compound: ASTM C309, Type I-D.
    1. Resin based, dissipates upon exposure to UV light.
    2. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
    3. Curing compounds used in water treatment plant construction to be nontoxic and taste and odor free.

M. Expansion Joint Filler:
    1. Exterior driveways, curbs and sidewalks:
        a. Asphalt expansion joint filler.

        b. ASTM D994.
    2. Other use:
        a. Fiber expansion joint filler.
        b. ASTM D1751.

N. Synthetic Fiber Reinforcing:
    1. 100% virgin polypropylene, fibrillated fibers containing no reprocessed olefin materials and specifically manufactured for use in concrete.
    2. Physical Characteristics:
        a. Specific gravity: 0.91.
        b. Tensile strength: 80 to 110 ksi.
        c. Modulus of Elasticity: 500 ksi.
        d. Fiber length: ¾ IN.

2.3 CONCRETE MIXES

A. General:
    1. All concrete to be ready mixed concrete conforming to ASTM C94 with all components and additives blended in at plant, unless otherwise approved.
    2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
    3. All concrete to be normal weight concrete.
    4. Mix shall contain 1.5 lbs of fibers per cubic yard.
    5. Mix shall contain fly ash.

B. Strength:
    1. Provide specified strength and type of concrete for each use in structure(s) as follows:

AREA	WEIGHT	SPECIFIED STRENGTH*
General Use Concrete	Normal weight	3000 psi

*Minimum 28-day compressive strength.

C. Air Entrainment: Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	5% +/- 1 ½%

    1. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump: 4 IN maximum, 1 IN minimum.
    1. Measured at point of discharge of the concrete into the concrete construction member.
    2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
    3. Pumped concrete:
        a. Provide additional water at batch plant or at site to allow for slump loss due to pumping.
            1) For site addition, hold back water from batch plant quantity.
        b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
            1) Do not exceed approved mix design’s water content.
    4. Determine slump per ASTM C143.

E. Selection of Proportions:
    1. General - Proportion ingredients to:
        a. Produce proper workability, durability, strength, and other required properties.
        b. Prevent segregation and collection of excessive free water on surface.

2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

	TARGET CEMENT CONTENT, LB/CY		MAXIMUM WATER TO CEMENT RATIO BY WEIGHT
SPECIFIED STRENGTH	(Sacks/CY)	(Lbs/CY)	
3000	5 ½	517	0.47

3. Fly ash:
   a. Substitute by weight of cement at rate of 1 LB fly ash for 1 LB of cement.
   b. Dosage to be between 15 and 25 percent of total cementitious product.
4. Sand cement grout:
   a. Three parts sand.
   b. One part Portland cement.
   c. Entrained air: Six percent plus or minus one percent.
   d. Sufficient water for required workability.
   e. Minimum 28-day compressive strength: 3,000 psi.
5. Normal weight concrete: Proportion mixture to provide desired characteristics using one of methods described below:
   a. Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
      1) Air content within range specified above.
      2) Record and report temperature of trial mixes.
      3) Proportion trial mixes per ACI 211.1.
   b. Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
      1) Field test records must be acceptable to Engineer to use this method.
      2) Test records shall represent materials, proportions and conditions similar to those specified.
6. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in paragraph 5.3.1 of ACI 318.

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

A. General:
   1. Contractor is responsible for design and erection of formwork.
   2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
      a. Allowable tolerances: As recommended in ACI 347R.
   3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs to drain.
      a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.

B. Openings: Provide openings in formwork to accommodate work of other trades.
   1. Accurately place and securely support items built into forms.

C. Chamfer Strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.

D. Reinforcement:
   1. Position, support and secure reinforcement against displacement.
   2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
   3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.

4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
5. Extend reinforcement to within 2 IN of concrete perimeter edges.
    a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
6. Unless otherwise indicated, provide minimum concrete cover as follows:
    a. Concrete deposited against earth: 3 IN.
    b. Formed surfaces exposed to weather or in contact with earth: 2 IN for reinforcing bars #6 or larger; 1-1/2 IN for reinforcing bars less than #6.
    c. Formed surfaces exposed to or located above any liquid: 2 IN.
    d. Interior surfaces: 1-1/2 IN for beams, girders and columns; 3/4 IN or bar diameter, whichever is greater, for slabs, walls and joists.
7. Do not weld reinforcing bars.

E. Construction, Expansion, and Contraction Joints:
1. Provide at locations indicated.
2. Locate wall vertical construction joints at 35 FT maximum centers and wall horizontal construction joints at 10 FT maximum centers, unless otherwise specified.
3. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SF unless otherwise specified.
4. Locate construction joints in columns and walls:
    a. At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
    b. Haunches, drop panels, and column capitals are considered part of the supported floor or roof and shall be placed monolithically therewith.
    c. Column based need not be placed monolithically with the floor below.
5. Install construction joints in beams, slabs, and girders perpendicular to the planes of their surfaces.
6. At least 72 HRS shall elapse between placing of adjoining concrete construction.
7. Thoroughly clean and remove all laitance, loose and foreign particles from construction joints.
8. Before new concrete is placed, coat all construction joints with an approved bonding adhesive used and applied in accordance with manufacturer's instructions.

F. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
2. Use setting diagrams, templates and instructions for locating and setting.
3. Secure waterstops in correct position.

G. Preparation:
1. Clean and adjust forms prior to concrete placement.
2. Tighten forms to prevent mortar leakage.
3. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

H. Placing Concrete:
1. Place concrete in compliance with ACI 304R and 304.2R.
2. Place in a continuous operation within planned joints or sections.
3. Begin placement when work of other trades affecting concrete is completed.
4. Place concrete by methods which prevent aggregate segregation.
5. Do not allow concrete to free fall more than 4 FT.
6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.

I. Consolidation:
1. Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.

J. Protection:
   1. Protect concrete from physical damage or reduced strength due to weather extremes.
   2. In cold weather comply with ACI 306R except as modified herein.
      a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
      b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 DegF	70 DegF
Between 30-45 DegF	60 DegF
Above 45 DegF	50 DegF

      c. Do not place heated concrete that is warmer than 80 DegF.
      d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 days or 70 DegF for 3 days.
      e. Do not allow concrete to cool suddenly.
   3. In hot weather comply with ACI 305R except as modified herein.
      a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
      b. Do not allow concrete temperature to exceed 90 DegF at placement.
      c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
      d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

K. Curing:
   1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
   2. Cure concrete by use of moisture retaining cover or by burlap kept continuously wet.
   3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
   4. Provide curing for minimum of 7 days.
   5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
   6. In hot weather follow curing procedures outlined in ACI 305R.
   7. In cold weather follow curing procedures outlined in ACI 306R.
   8. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of above methods or by membrane curing compound for the remainder of the curing period.
   9. Curing vertical surfaces with a curing compound: Cover vertical surfaces with a minimum of two coats of the curing compound.
      a. Allow the preceding coat to completely dry prior to applying the next coat.
      b. Apply the first coat of curing compound immediately after form removal.
      c. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
      d. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

L. Form Removal:
   1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
   2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.

3.2 CONCRETE FINISHES

A. Tolerances:
  1. Class B: 1/4 IN in 10 FT for all work.

B. Surfaces Exposed to View:
  1. Provide a smooth finish for exposed concrete surfaces and surfaces that are to be covered with a coating or covering material applied directly to concrete.
  2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with matching color cement grout.
  3. Fill tie holes with nonshrink nonmetallic grout.

C. Surfaces Not Exposed to View:
  1. Patch voids, air pockets and honeycomb areas with matching color cement grout.
  2. Fill tie holes with nonshrink nonmetallic grout.

D. Slab Floated Finish:
  1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
  2. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
  3. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.
  4. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
  5. Refloat slab immediately to a uniform sandy texture.

E. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

3.3 GROUT

A. Preparation:
  1. Nonshrinking nonmetallic grout:
    a. Clean concrete surface to receive grout.
    b. Saturate concrete with water for 24 HRS prior to grouting.
  2. Epoxy grout: Apply only to clean, dry, sound surface.

B. Application:
  1. Nonshrinking nonmetallic grout:
    a. Mix in a mechanical mixer.
    b. Use no more water than necessary to produce flowable grout.
    c. Place in accordance with manufacturer's instructions.
    d. Completely fill all spaces and cavities below the bottom of baseplates.
    e. Provide forms where baseplates and bedplates do not confine grout.
    f. Where exposed to view, finish grout edges smooth.
    g. Do not extend grout above bottom of plate.
    h. Slope and finish edges flush at the baseplate, bedplate, member, or piece of equipment.
    i. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
    j. Wet cure grout for 7 days, minimum.
  2. Epoxy grout:
    a. Mix and place in accordance with manufacturer's instructions.
    b. Completely fill all cavities and spaces around dowels and anchors without voids.
    c. Obtain manufacturer's field technical assistance as required to ensure proper placement.

3.4 FIELD QUALITY CONTROL

A. Contractor will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.

   1. Contractor to provide Owner with test results as soon as results are available.

B. Tests During Construction:
   1. Strength test - procedure:
      a. Four cylinders, 6 IN DIA x 12 IN high, will be taken from each sample per ASTM C172 and C31.
      b. Cylinders will be tested per ASTM C39:
         1) One at 7 days.
         2) Two at 28 days.
         3) One held in reserve.
   2. Strength test - frequency:
      a. Not less than one test each day concrete placed.
      b. Not less than one test for each 50 CY or major fraction thereof placed in one day.
      c. Not less than one test for each type of concrete poured.
      d. Not less than one test for each concrete structure exceeding 2 CY volume.
      e. Not less than one test for each delivery where water addition has been approved at the jobsite.
   3. Slump test: Per ASTM C143.
      a. Determined for each strength test sample.
      b. Additional slump tests may be taken.
   4. Air content: Per ASTM C231, C173, and C138.
      a. Determined for each strength test sample.
   5. Temperature: Determined for each strength test sample.

C. Evaluation of Tests:
   1. Strength test results: Average of 28-day strength of two cylinders from each sample.
      a. If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
      b. If both cylinders show any of above defects, test will be discarded.

D. Acceptance of Concrete:
   1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
      a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
      b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
   2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
      a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.5 SCHEDULES

A. Form Types:
   1. Surfaces exposed to view:
      a. Prefabricated or job-built wood forms.
      b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
      c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
      d. Construct forms sufficiently tight to prevent leakage of mortar.
   2. Surfaces not normally exposed to view:
      a. Wood or steel forms sufficiently tight to prevent leakage of mortar.

B. Grout:
   1. Nonshrinking nonmetallic grout: General use.
   2. Epoxy grout:
      a. Grouting of dowels and anchor bolts into existing concrete.
      b. Other uses indicated on Drawings.

C. Concrete:
   1. Normal weight concrete: All locations.

D. Concrete Finishes:
   1. Broom finish: Sidewalks and other exterior surfaces subject to foot traffic, including leachate canopy areas.
   2. Exposed to view: All walls and exposed vertical edges.
   3. Floated finish: All other locations.

END OF SECTION

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SECTION 11005
EQUIPMENT: BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements of this Section apply to all equipment provided on the Project including that found in Divisions 11, 12, 13, 14, 15, and 16, even if not specifically referenced in individual "Equipment" articles of those Specifications.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Section 05505 - Metal Fabrications.
   3. Section 09905 - Painting and Protective Coatings.
   4. Section 10400 – Identification, Stenciling, & Tagging Systems.
   5. Section 15060 - Pipe and Pipe Fittings: Basic Requirements.
   6. Section 15100 - Valves: Basic Requirements
   7. Section 13440 - Instrumentation for Process Control: Basic Requirements
   8. Section 13442 - Field Instrumentation
   9. Section 16010 - Electrical: Basic Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Bearing Manufacturers Association (ABMA).
   2. American Gear Manufacturers Association (AGMA).
   3. ASTM International (ASTM):
      a. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   4. Institute of Electrical and Electronics Engineers (IEEE):
      a. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
   5. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment.
      b. ICS 6, Enclosures for Industrial Control and System.
      c. MG 1, Motors and Generators.
   6. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).
   7. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910, OSHA Safety and Health Standards for General Industry (referred to herein as OSHA standards).

B. Miscellaneous:
   1. A single manufacturer of a "product" to be selected and utilized uniformly throughout Project even though:
      a. More than one manufacturer is listed for a given "product" in Specifications.
      b. No manufacturer is listed.
   2. Equipment, electrical assemblies, related electrical wiring, instrumentation, controls, and system components shall FULLY comply with specific NEC requirements related to area classification and to NEMA 250 and NEMA ICS 6 designations {shown on Electrical Power Drawings} {and defined in Section 16010}.
   3. Utilize only year 2000 compliant equipment and software.

1.3 DEFINITIONS

A. Product: Manufactured materials and equipment.

B. Major Equipment Supports - Supports for Equipment:
  1. Located on or suspended from elevated slabs with supported equipment weighing 2000 LBS or greater, or:
  2. Located on or suspended from roofs with supported equipment weighing 500 LBS or greater, or:
  3. Located on slab-on-grade or earth with supported equipment weighing 5000 LBS or more.

C. Equipment: One or more assemblies capable of performing a complete function. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection. Not limited to items listed under "Equipment" article within specifications.

D. Year 2000 Compliant Equipment and Software: Equipment and software for which neither performance or functionality is affected by dates prior to, during, or after the year 2000.

E. Installer or Applicator: Installer or applicator is the person actually installing or applying the product in the field at the Project site.
  1. Installer and applicator are synonymous.

1.4 SUBMITTALS

A. Shop Drawings:
  1. General for all equipment:
    a. See Section 01340.
    b. Data sheets that include manufacturer's name and complete product model number. Clearly identify all optional accessories that are included.
    c. Acknowledgement that products submitted comply with the requirements of the standards referenced.
    d. Manufacturer's delivery, storage, handling, and installation instructions.
    e. Equipment identification utilizing numbering system and name utilized in Drawings.
    f. Equipment installation details:
      1) Location of anchorage.
      2) Type, size, and materials of construction of anchorage.
      3) Anchorage setting templates.
      4) Manufacturer's installation instructions.
    g. Equipment area classification rating.
    h. Shipping and operating weight.
    i. Equipment physical characteristics:
      1) Dimensions (both horizontal and vertical).
      2) Materials of construction and construction details.
    j. Equipment factory primer and paint data.
    k. Manufacturer's recommended spare parts list.
    l. Equipment lining and coatings.
    m. Equipment utility requirements include air, natural gas, electricity, and water.
    n. Ladders and platforms provided with equipment:
      1) Certification that all components comply fully with OSHA requirements.
      2) Full details of construction/fabrication.
      3) Scaled plan and sections showing relationship to equipment.
  2. Mechanical and process equipment:
    a. Operating characteristics:
      1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.
      2) Brake horsepower requirements.
      3) Copies of equipment data plates.
    b. Piping and duct connection size, type and location.
    c. Equipment bearing life certification.
    d. Equipment foundation data:
      1) Equipment center of gravity.

        2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.
3. Electrical and control equipment:
    a. Electric motor information:
        1) Documentation that motors provided are manufacturer's energy efficient type and not standard efficiency motors.
            a) When standard efficiency motors are submitted, provide documentation why energy efficient motors are not available.
        2) Nameplate data as required by the NEC.
            a) Manufacturer's name.
            b) Rated voltage.
            c) Full load current.
            d) Rated frequency.
            e) Number of phases.
            f) Rated full load speed.
            g) Insulation system class and rated ambient temperature or rated temperature rise.
            h) Time rating: 5, 15, 30, 60 minutes, or continuous.
            i) Rated HP.
            j) Code letter or locked rotor current.
            k) NEMA design letter.
            l) Marked "Thermally Protected" where applicable.
        3) Motor service factor.
        4) Motor enclosure type.
        5) NEMA frame size.
        6) NEMA design code.
        7) Insulation type and temperature rise.
        8) Motor locked rotor current.
        9) Current, efficiency and power factor at 1/2, 3/4 and full load.
        10) Power factor correction data for motors 20 HP and above.
    b. Electrical gear:
        1) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.
    c. Control panels:
        1) Panel construction.
        2) Point-to-point ladder diagrams.
        3) Scaled panel face and subpanel layout.
        4) Technical product data on panel components.
        5) Panel and subpanel dimensions and weights.
        6) Panel access openings.
        7) Nameplate schedule.
        8) Panel anchorage.
4. Year 2000 compliant equipment and software.
    a. Certification that equipment and software is year 2000 compliant.
5. Systems schematics and data:
    a. Provide system schematics where required in system specifications.
        1) Acknowledge all system components being supplied as part of the system.
        2) Utilize equipment, instrument and valving tag numbers defined in the contract documents for all components.
        3) Provide technical data for each system component showing compliance with the Contract Document requirements.
        4) For piping components, identify all utility connections, vents and drains which will be included as part of the system.

B. Operation and Maintenance Manuals:
    1. See Section 01340.

C. Miscellaneous Submittals:
   1. Sample form letter for equipment field certification.
   2. Certification that equipment has been installed properly, has been initially started up, has been calibrated and/or adjusted as required, and is ready for operation.
   3. Certification for major equipment supports that equipment foundation design loads shown on the Drawings or specified have been compared to actual loads exhibited by equipment provided for this Project and that said design loadings are equal to or greater than the loads produced by the equipment provided.
   4. Field noise testing reports if such testing is specified in narrow scope sections.
   5. Field vibration testing reports if vibration testing is specified in narrow scope sections.
   6. Notification, at least 1 week in advance, that motor testing will be conducted at factory.
   7. Certification from equipment manufacturer that all manufacturer-supplied control panels that interface in any way with other controls or panels have been submitted to and coordinated with the supplier/installer of those interfacing systems.
   8. Motor test reports.
   9. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-made modifications.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Motors:
      a. Baldor.
      b. General Electric.
      c. Reliance Electric.
      d. Siemens.
      e. Teco-Westinghouse.
      f. U.S. Motors.

B. Submit requests for substitution in accordance with Specification Section 01630.

2.2 YEAR 2000 COMPLIANT EQUIPMENT AND SOFTWARE

A. All equipment which utilizes microprocessors, computers, embedded chips, integrated circuits, operating systems, or PLCs shall be demonstrated to be year 2000 compliant.

B. All software shall be demonstrated to be year 2000 compliant.

C. Compliance Requirements:
   1. General Integrity:
      a. Value for the current date shall not interrupt operation.
      b. System shall return the correct date accurate to century in response to a request for current date, and software shall be unaffected by any value returned.
   2. Date Integrity: Correct results shall be returned in the operation of all legal arithmetic, logical, and calendar operations of dates that span century marks within the range of the software.
   3. Explicit Century: Software's internal date storage format shall explicitly include the century and reporting formats, allowing date representation in the full century format.
   4. Implicit Century: On encountering data that does not include the century, either from transaction input or from an external data source, the century value is unambiguously inferred by the software.

2.3 ACCESSORIES

A. Data Plate:
  1. Attach a stainless steel data plate to each piece of rotary or reciprocating equipment.
  2. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.

B. Gages:
  1. Provide gages in accordance with Section 13442.
  2. Provide at the following locations:
    a. At locations identified on Drawings.
  3. Utilize tapping sleeves for mounting per Section 15060.

C. Lifting Eye Bolts or Lugs:
  1. Provide on all equipment 50 LBS or greater.
  2. Provide on other equipment or products as specified in the narrow specifications.

D. Platforms and Ladders:
  1. Design and fabricate in accordance with OSHA standards.
  2. Fabricate components from fiberglass-reinforced plastic.
  3. Provide platform surface: Non-skid grating, unless specified in narrow scope specification.

2.4 FABRICATION

A. Design, fabricate, and assemble equipment in accordance with modern engineering and shop practices.

B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.

C. Furnish like parts of duplicate units to be interchangeable.

D. Ensure that equipment has not been in service at any time prior to delivery, except as required by tests.

E. Furnish equipment which requires periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.

F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option. Provide drain connection for 3/4 IN PVC tubing.

G. Machine the mounting feet of rotating equipment.

H. Fabricate equipment which will be subject to Corrosive Environment in such a way as to avoid back to back placement of surfaces that can not be properly prepared and painted. When such back to back fabrication can not be avoided, provide continuous welds to seal such surfaces from contact with corrosive environment.

2.5 SHOP OR FACTORY PAINT FINISHES

A. Electrical Equipment:
  1. Provide factory-applied paint coating system(s) for all electrical equipment components except those specified in Section 09905 to receive field painting.

B. Field paint other equipment in accordance with Section 09905.

2.6 SOURCE QUALITY CONTROL

A. Motor Tests:
  1. Test motors in accordance with NEMA and IEEE standards.
  2. Provide routine test for all motors.

3. The Owner reserves the right to select and have tested, either routine or complete, any motor included in the project.
    a. The Owner will pay all costs, including shipping and handling, for all motors successfully passing the tests.
    b. The Contractor shall pay all costs, including shipping and handling, for all motors failing the tests.
    c. If two successive motors of the same manufacturer fail testing, the Owner has the right to reject all motors from that manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment as shown on Drawings and in accordance with manufacturer's directions.

3.2 INSTALLATION CHECKS

A. For all equipment specifically required in detailed specifications, secure services of experienced, competent, and authorized representative(s) of equipment manufacturer to visit site of work and inspect, check, adjust and approve equipment installation. In each case, representative(s) shall be present during placement and startup of equipment and as often as necessary to resolve any operational issues which may arise.

B. Secure from equipment manufacturer's representative(s) a written report certifying that equipment:
1. Has been properly installed and lubricated.
2. Is in accurate alignment.
3. Is free from any undue stress imposed by connecting piping or anchor bolts.
4. Has been operated under full load conditions and that it operated satisfactorily. Secure and deliver a field written report to Owner immediately prior to leaving jobsite.

C. No separate payment shall be made for installation checks. All or any time expended during installation check does not qualify as O&M training or instruction time when specified.

3.3 IDENTIFICATION OF EQUIPMENT AND HAZARD WARNING SIGNS

A. Identify equipment and install hazard warning signs in accordance with Section 10400.

3.4 FIELD PAINTING AND PROTECTIVE COATINGS

A. For required field painting and protective coatings, comply with Section 09905.

3.5 WIRING CONNECTIONS AND TERMINATION

A. Clean wires before installing lugs and connectors.

B. Coat connection with oxidation eliminating compound for aluminum wire.

C. Terminate motor circuit conductors with copper lugs bolted to motor leads.

D. Tape stripped ends of conductors and associated connectors with electrical tape. Wrapping thickness shall be 150 percent of the conductor insulation thickness.

E. Connections to carry full ampacity of conductors without temperature rise.

F. Terminate spare conductors with electrical tape.

3.6 FIELD QUALITY CONTROL

A. Furnish equipment manufacturer services as specified in the individual equipment specifications.

B. Inspect wire and connections for physical damage and proper connection.

C. After installation and prior to energizing the motor, provide insulation resistance test of all motors.
   1. Conduct test with 500 or 1000 Vdc megger.
   2. Test each phase separately.
   3. Disconnect all extraneous leads to the motor.
   4. Comply with NEMA MG-1 safety requirements and test procedures.

D. Bump motor to check for correct rotation:
   1. Ensure motor has been lubricated.
   2. Check prior to connection to driven equipment.

E. Subbase that supports the equipment base and that is made in the form of a cast iron or steel structure that has supporting beams, legs and cross member that are cast welded or bolted, shall be tested for a natural frequency of vibration after equipment is mounted. Keep the ratio of the natural frequency of the structure to the frequency of the disturbing force out of the range from 0.5 to 1.5.

3.7 DEMONSTRATION

A. Demonstrate equipment in accordance with Section 01650.

END OF SECTION

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SECTION 11060

PUMPING EQUIPMENT: BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pumping equipment.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Section 11005 - Equipment: Basic Requirements.
   3. Section 11095 - Pumping Equipment: Submersible Leachate and Groundwater Pumps

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Hydraulic Institute (HI):
      a. Standards for centrifugal, rotary and reciprocating pumps.

B. Fully coordinate all mechanical seal systems specified to ensure pump and seal compatibility.

1.3 DEFINITIONS

A. The abbreviations are defined as follows:
   1. IPS: Iron Pipe Size.
   2. NPSHR: Net Positive Suction Head Required.
   3. NPSHA: Net Positive Suction Head Available.
   4. TDH: Total Differential Head.
   5. TEFC: Totally Enclosed Fan Cooled.
   6. VFD: Variable Frequency Drive.

B. Pump Service Category - Pump or pumps having identical names (not tag numbers) used for specific pumping service.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 11005.
   2. Product technical data including:
      a. Performance data and curves with flow (gpm), head (FT), horsepower, efficiency, NPSH requirements, submergence requirement.
      b. Pump accessory data.
      c. Bearing supports, shafting details and lubrication provisions.
      d. Solids passage information.
   3. Certifications:
      a. Certified pump performance curves as described in Article 2.4.
   4. Test reports:
      a. Factory hydrostatic test.

B. Operation and Maintenance Manuals:
   1. See Section 01340.

C. Miscellaneous:
   1. Certifications:
      a. Statement relative to installation and start-up per Paragraph 3.2A.4.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
  1. Pumps:
    a. See individual pump specification sections.

B. Submit requests for substitution in accordance with Specification Section 01630.

2.2 CENTRIFUGAL PUMP DESIGN

A. Provide units with increasing head characteristics from the end run out portion of the curve to shutoff condition.

2.3 ACCESSORIES

A. See Section 11005.

B. Each Unit:
  1. Lifting eye bolts or lugs.
  2. Plugged gage cock connection at suction and discharge nozzles.
  3. Tapped and plugged openings for casing and bearing housing vents and drains.
  4. Fittings for properly adding flushing lubricant.
  5. Pressure relief fittings for grease lubrication.

C. Packing Seal:
  1. Provide mechanical seal.

D. Mechanical Seals:
  1. Provide as specified in the narrow-scope pump sections.
  2. Provide rotating balanced O-ring type.
  3. Provide water lubrication - cooling.
  4. Materials:
    a. Metal parts except springs: 316 stainless steel.
    b. Springs: Hastelloy C.
    c. Seal faces: Unfilled carbon graphite versus silica-free Grade 99.5 ceramic.
    d. Elastomers: Viton.

2.4 SOURCE QUALITY CONTROL

A. If specifically required in the individual pump specification sections, provide factory tests:
  1. All units:
    a. Hydrostatic test at 150 percent of shutoff head for a minimum of 5 minutes.
  2. Constant speed units:
    a. Head (FT) versus flow (gpm) pump curves:
      1) Efficiencies along curve.
      2) Brake horsepower along each curve.
  3. Results certified by a registered professional engineer.

B. Statically and dynamically balance each pump per HI standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. See Section 11005.

B. Submersible Units:
   1. Assemble connecting piping with gaskets in place and minimum of four bolts per joint installed and tightened. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange. Realign as necessary, install flange bolts and make equipment connection.

3.2 FIELD QUALITY CONTROL

A. Provide services of equipment manufacturer's field service representative(s) to:
   1. Inspect equipment covered by these Specifications.
   2. Supervise pre-start adjustments and installation checks.
   3. Conduct initial startup of equipment and perform operational checks.
   4. Provide a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by Owner's personnel.
   5. Instruct Owner's personnel for the specified minimum number of hours at jobsite per Section 01060 on operation and maintenance of each of following pumping equipment:
      a. Section 11095 - Pumping Equipment: Submersible Leachate and Groundwater Pumps, 8 hours.

3.3 MANUFACTURER’S FIELD SERVICES

A. The manufacturer shall check and approve the installation during construction and prior to initial operation. Prior to initial start-up, a written statement shall be provided by the manufacturer stating that the equipment has been installed by the Contractor in accordance with the Drawings, Specifications and manufacturer’s shop drawings and is ready to be placed into operation. The manufacturer shall test operate the system in the presence of the Engineer and shall verify the equipment conforms with the specified requirements. The manufacturer shall re-visit the project site as often as necessary until all deficiencies are corrected and the installation of operation is satisfactory to the Engineer.

B. The manufacturer shall provide a minimum 8-hour training session to landfill personnel in the operation and maintenance of the equipment.

C. The manufacturer and/or installer shall conduct two follow-up inspections after initial operations begin. One to occur within three months and the second to occur within six months of initial operations.

END OF SECTION

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SECTION 11095

PUMPING EQUIPMENT: SUBMERSIBLE LEACHATE PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections include but are not necessarily limited to:
  1. Section 11005 - Equipment: Basic Requirements
  2. Section 11060 - Pumping Equipment: Basic Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
  1. American Iron and Steel Institute (AISI):
     a. Steel Products Manual.
  2. American National Standard Institute (ANSI).
  3. American Society for Testing and Materials (ASTM):
     a. A48, Standard Specification for Gray Iron Castings.
  4. Factory Mutual (FM).
  5. Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps (HI).
  6. National Electrical Manufacturer's Association (NEMA):
     a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
     b. ICS 6, Enclosures for Industrial Controls.
  7. National Fire Protection Agency (NFPA):
     a. 70, National Electrical Code (NEC).
  8. Underwriters Laboratories, Inc. (UL).

B. It is the intention of these Specifications that the pump, control panel, level controls, and flow meter be sole source (i.e., provided by one supplier) who shall assume responsibility for the operation of the system.

1.3 SUBMITTALS

A. Shop Drawings: Requirements in Section 11060.
  1. Submit drawings of pump in operating position within riser pipe and appropriate level set points.

B. Operation and Maintenance Manuals: See Section 01340.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
  1. Submersible Leachate Pumping System:
     a. Leachator Pumping Systems.
     b. EPG Companies.
     c. Gunn Co. Sideslope Pump
     d. Pumpex, Inc.
     e. Blackhawk Environmental Company

2. Control Components:
    a. Square D.
    b. Westinghouse/Cutler Hammer.
    c. Siemens.

B. Submit requests for substitution in accordance with Specification Section 01630.

C. Named manufacturers must provide equipment of the highest quality which complies with the Specification as written. All exceptions must be submitted by the equipment manufacturer for Engineer's consideration prior to bid. Any deviations or exceptions not approved prior to bid shall be cause for rejection of equipment.

2.2 MATERIALS

A. Furnish unit component meeting or exceeding the following material specifications:
    1. Pump case: 316 Stainless Steel.
    2. Motor housing: 316 Stainless Steel.
    3. Impeller: 316 Stainless Steel.
    4. Shaft: Stainless steel, ANSI Series 300 or 400.
    5. Wear ring: Corrosion and wear resistant materials.
    6. O-rings: Buna-N or Nitrile rubber or viton.
    7. Bolts and nuts: Stainless steel.
    8. Lower ring seal: Silicon-Carbon.
    9. Upper ring seal: Carbon-Ceramic.
    10. Seal metal parts: Stainless steel.

2.3 EQUIPMENT

A. Performance Requirements:
    1. Submersible Leachate Pump (LP-1).
        a. Design condition: ____ gpm at ____ ft TDH.
        b. Maximum pump speed: ____ rpm.
        c. Minimum horsepower: ____ HP.
        d. Drive type: Constant speed.
    2. Submersible Leachate Pump (LP-2).
        a. Design condition: ____ gpm at ____ ft TDH.
        b. Maximum pump speed: ____ rpm.
        c. Minimum horsepower: ____ HP.
        d. Drive type: Constant speed.
    3. Submersible Leachate Pump (LP-3).
        a. Design condition: ____ gpm at ____ ft TDH.
        b. Maximum pump speed: ____ rpm.
        c. Minimum horsepower: ____ HP.
        d. Drive type: Constant speed.
    4. Submersible Leachate Pump (LP-4).
        a. Design condition: ____ gpm at ____ ft TDH.
        b. Maximum pump speed: ____ rpm.
        c. Minimum horsepower: ____ HP.
        d. Drive type: Constant speed.
    5. Submersible Leachate Pump (LP-5).
        a. Design condition: ____ gpm at ____ ft TDH.
        b. Maximum pump speed: ____ rpm.
        c. Minimum horsepower: ____ HP.
        d. Drive type: Constant speed.
    6. Submersible Groundwater Pump (GP-1, GP-2, GP-3, GP-4, and GP-5).
        a. Design condition: ____ gpm at ____ ft TDH.
        b. Maximum pump speed: ____ rpm.
        c. Minimum horsepower: ____ HP.

        d. Drive type: Constant speed.

2.4 ACCESSORIES

A. See Section 11060.

B. Carriage:
   1. Each pump shall be mounted in a 300 series stainless steel carriage sized for use in the specified 24-inch HDPE riser pipe with a constant inside diameter set at a 4:1 slope.
   2. An inlet strainer and level sensor clamp shall be provided. The level sensor shall be installed without disassembly or removal of the pump.
   3. The carriage shall provide a low center of gravity and all wheels shall remain in contact with the contour of the riser pipe.
   4. The carriage shall be designed to allow removal of pump and motor should it be required.
   5. Provide a retrieval cable of 300 series stainless steel complete with stainless steel snap hook and associated hardware.

C. Discharge Hose and Fittings:
   1. Discharge hose shall be rated at 300 psi and -20 to 180 degrees Fahrenheit.
   2. All fittings shall be 300 series stainless steel, as recommended by the hose manufacturer.

D. Control Panel:
   1. The control panel shall provide level control, pump operation, and motor protection.
   2. The control panel power shall be 480V, 3 phase, 3 wire, grounded wye.
   3. Control panel shall consist of a NEMA 4X stainless steel enclosure with a sunshade and rain guard and lockable outer cover. The door shall open a minimum of 180 degrees.
   4. The inner door shall be a painted steel dead front mounted on a continuous aircraft type hinge. The dead front door shall contain cutouts for the mounted equipment and operator accessible equipment, and provide protection of personnel from live internal wiring.
   5. Operator accessible components mounted on the dead front door shall include the following:
      a. H-O-A switch for each pump.
      b. STAND-BY indicating light (amber).
      c. RUN indicating light (green).
      d. OVERLOAD indicating light (red).
      e. Digital read out level indicator.
      f. Elapsed run time meter.
      g. Main disconnect breaker switch.
      h. Pump breaker switch.
      i. Control circuit breaker switch.
      j. Digital read-out flowmeter.
   6. The back plate shall consist of 12-gauge sheet steel and finished with a primer coat and two coats of baked on enamel. All hardware mounted to the subpanel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified with phenolic engraved nameplates.
   7. The panel power distribution shall include all necessary components and shall be completely wired with standard copper conductors rated at 90 degrees C. Control wiring shall be a minimum of 14 gauge and installed in Panduit type wiring trays.
   8. Breakers:
      a. Individual circuit breaker shall be provided for main power, pump, and control circuits. All circuit breakers shall be heavy-duty thermal magnetic or motor circuit protectors similar and equal to Square D type FAL. Circuit breakers shall be indicating type, providing ON-OFF-TRIP positions. When the breaker is tripped automatically, the handle shall assume a middle position indicating TRIP.
      b. Thermal magnetic breakers shall be quick-make and quick break on manual and automatic operation, and have inverse time characteristics secured using bi-metallic tripping elements supplemented by a magnetic trip.
      c. Breakers shall be designed so that an overload on one pole automatically trips and opens all legs. Field installed handle ties shall not be acceptable.

9. Motor starter shall be open frame, across the line, NEMA rated with individual overload protection in each leg. Motor starter contact and coil shall be replaceable from the front of the starter without removing it from its position. Overload heaters shall be block type, utilizing melting alloy spindles and shall provide visual trip indication and an alarm contact for alarming signals. The overload shall be sized for the full load amperage draw of the pump. Adjustable type overloads, definite purpose contactors, fractional size starters, and horsepower rated contactors or relays shall not be acceptable.
10. A control transformer shall be used to provide the 120 VAC for control circuits. Provide primary and secondary circuit breakers. Include a 15 amp, single pole, 120 V circuit breaker in the panel for Owner's use.
11. Transient voltage surge suppression (TVSS) shall be provided on incoming power and on control voltage source. Device shall be UL 1449 listed.
12. A thermostat controlled heater shall be provided to control the inside temperature above the dew point to alleviate the buildup of condensate in the control enclosure.
13. A corrosion inhibitor shall be provided within the enclosure.
14. A red, top-mounted, visual, high level alarm beacon, which shall be weatherproof and shatterproof, shall be provided with a 40 watt flashing LED light. Provide high level contact closure for wiring to the alarm dialer.

E. Level Control:
   1. A panel mounted controller digital readout display shall provide level indication of the sideslope sump. The pump "ON-OFF-HIGH LEVEL" selection shall be through level indicating/controller that allows check/adjustment of level settings and screwdriver adjustment operation from the front without opening the dead front door. The controller unit will accept a 4 to 20 ma signal from the transducer and provide a level indication readout of 0 to 138 inches of liquid.
   2. A submersible transducer shall be provided with a suitable cable. The transducer shall be all 316 stainless steel and shall be mounted to the pump carriage. The unit shall provide a 4-20 ma signal output to the control unit over the entire range at levels encountered in the basin. Static accuracy rating shall be no less than 1.0%. Provide sensor mounted surge arrestor.
   3. A permanent bellows level sensor breathing device, or approved equal, shall be mounted in control panel or junction box to prevent moisture in the vent tube.

F. Cable Fittings: Non-metallic gas tight cable exit fittings properly sized for the power and control cables shall be provided.

G. Flow Meter System:
   1. Furnish an ultrasonic flow meter system to register flow and record totalized flow rate for each pump.

H. Power cable
   1. Provide heavy duty submersible type, continuous length, sized per U.S. NEC standards. A strain relief/riser exit fitting shall be provided. The cable shall be equal to the riser pump length plus 20'.

2.5 FABRICATION

A. General:
   1. Provide pumps capable of handling primary landfill leachate.
   2. Design pump to allow for removal without entering the sump and without removal of bolts, nuts or other fastenings.

B. Impeller:
   1. Provide closed impeller in accordance with Hydraulic Institute Standards.
   2. Provide wear ring as necessary to assure efficient sealing between volute and impeller.

C. Shaft:
   1. Design pump shaft of sufficient size to transmit full driver output.

2. Use shaft which is accurately machined and constructed with sufficient materials.

D. Bearings:
   1. Support shaft on upper and lower permanently lubricated bearings with a minimum B-10 life of 15,000 HRS.

E. Motors:
   1. Provide motor of totally submersible design, constructed with epoxy or poly-seal encapsulated windings, air-filled or dielectric oil filled, with Class F insulation and rated for continuous duty operation.
   2. Motor shall be 3 PH, 60 cycle, 460 V.

2.6 SOURCE QUALITY CONTROL

A. Secure from the pump manufacturer the following inspections and tests on each pump before shipment from factory:
   1. Check impeller, motor rating, and electrical connections for compliance with Specification.
   2. Test motor and cable insulation for moisture content or insulation defects.
   3. Run pump for 30 minutes submerged.
   4. After operational test #3, perform insulation test (#2) again.

PART 3 - EXECUTION

3.1 PUMP SET POINTS

A. Base pump set points on the following level sensor readings.
   1. Pump on 12 inches
   2. Pump off 6 inches

3.2 START-UP AND TRAINING

A. The manufacturer of the system shall provide field supervision/assistance for installation and start-up of the system. The scheduling of this service shall be coordinated with the Contractor to insure the riser is in place and the control panel is connected to power prior to arrival of the factory field technician.

B. A start-up report shall be provided to include all component settings and motor operating characteristics data. The report shall certify the system is properly installed. Any deficiencies found shall be corrected.

C. At the time of installation, the Contractor shall coordinate with the system supplier and owner to provide operator training and troubleshooting in the field.

D. A complete operations and maintenance manual for the system shall be provided. Information shall include installation and removal procedures, system operation explanation, equipment lists, bill of materials, parts information, service contact information, and instructions for each component provided. The manual shall have an index to reference location of each document.

END OF SECTION

SECTION 13251

FACTORY COATED BOLTED STEEL TANK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Atmospheric wastewater landfill (leachate) tank.

B. Related Sections include but are not necessarily limited to:
   1. Section 11005 - Equipment: Basic Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials (ASTM):
      a. A36, Structural Steel.
      b. A285, Low and Intermediate Tensile Strength Carbon Steel Plates.
      c. A570, Hot-Rolled Sheet and Strip, Structural Quality.
   2. American Water Works Association (AWWA):
      a. D103, Standard for Factory Coated Bolted Steel Tanks.
   3. Occupational, Safety and Health Administration (OSHA).
   4. Steel Structures Painting Council Standards (SSPC):
      a. SP-6, Commercial Blast Cleaning.
      b. SP-10, Near-White.

B. Qualifications: Manufacturers to have own fabricating plant and have designed, fabricated, and erected at least five storage tanks of capacity and type specified, for MSW leachate storage.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Product technical data including:
      a. Acknowledgement that product submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
   2. Fabrication and/or layout drawings:
      a. Complete construction details. Anchor bolt sizes and locations for installation by Contractor.
      b. Complete detailed drawings of equipment furnished.
      c. Foundation load requirements.
      d. Tank design calculations.
      e. Location of penetrations and ancillary equipment.
   3. Test reports.
   4. Certifications: Certificates of compliance with standards specified for all major components incorporated into work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Steel Members:
   1. Handle and store steel members above ground on platforms, skids, or other supports.
   2. Keep members free of dirt, grease and other foreign material.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
  1. Tanks:
    a. Engineered Storage Produtcs Company.
    b. Or approved equal.

2.2 MATERIALS

A. Atmospheric Wastewater Tank:
  1. In accordance with AWWA D103,

2.3 ATMOSPHERIC WASTEWATER TANK DESIGN REQUIREMENTS

A. Equalization Tank:
  1. Size:
    a. Nominal Capacity: 501,000 GAL.
    b. Inside diameter: TBD
    c. Height: TBD
  2. Design tank in accordance with AISC specifications.
  3. Environmental, Wind, Seismic, Live, Dead, Equipment, and Snow loads: In accordance with API 650.
  4. Design tank to support stairs, dead and live load, plus any equipment supported by the tank.
  5. Corrosion Allowance: 1/16"
  6. Provide bolted steel walls and bottom with a 3-foot diameter sump as shown on Drawings.
  7. Design Conditions:
    a. Pressure: Atmospheric - Open Top.
    b. Temperature: 5 to 100 Deg f.
    c. Specific Gravity: 1.05.
  8. Provide anchor bolts, tie-down lugs, and other materials as required to install tank to foundation.
  9. Tank shall be designed to accommodate a future increase in height, using the same foundation slab and steel floor assembly. Future height is TBD.
  10. Connections: Design all openings and connections in accordance with AWWA D103, with sizes and locations as specified in the Drawings. All nozzles shall be 304 stainless steel.
  11. Coating: Glass coated, per AWWA Section 10.4.
  12. Coating color: cobalt blue. Alternative coating color (if chosen): Forest Green.

2.4 ACCESSORIES

A. Nominal 24-inch dia. manway with hinged cover and gasket, in accordance with AWWA D103.

B. Foundation:
  1. The tank manufacturer shall review a foundation for the tank and confirm design loading. Foundation shall be designed for a future tank capacity of 570,000 gallons.
  2. Footing design shall be based on 3,000 psf soil bearing capacity or greater as determined by geotechnical analysis performed by a licensed soils engineer.
  3. The tank manufacturer shall furnish to the Engineer detailed foundation plans, design sheets, and calculations. No excavation for foundations shall be made until foundation shop drawings have been approved by the Engineer.

C. Tank shall be equipped with a stainless steel float and target type level indicator. Indicator shall be Varec, Series 6700, or equal, and numerically labeled in terms of feet. All wetted parts and top anchors shall be stainless steel. Cable guide shall be braced sufficient to support weight and thrust imposed by Vultures.

D. An aluminum gaugeboard shall be mounted on the inside of tank. The gaugeboard shall be vinyl coated and numerically labeled in terms of feet.

E. Mixer and blower assembly.
   1. 25 HP side entry mixer with stainless steel welted parts.
   2. Blower system 250 cfm at 13 psi.
   3. Air piping sufficient to introduce air near mixer impeller.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect tanks in accordance with manufacturer's instructions.

B. Nameplates:
   1. Nameplate data to include:
      a. Manufacturer's name.
      b. Tank capacity.
      c. Equipment number.
      d. Design and operating pressure.
      e. Date of construction.

3.2 FIELD QUALITY CONTROL

A. FIELD QUALITY CONTROL
   1. Testing:
      a. After construction of tank is complete test in accordance with AWWA D103.
      b. Repair leaks. Do not perform work on any joint unless the water is at least 2 FT below the point being repaired.
      c. Properly restore any damaged coating.

END OF SECTION

SECTION 15060

PIPE AND PIPE FITTINGS: BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
  1. Landfill leachate piping systems
  2. Landfill groundwater piping systems
  3. Process piping systems.
  4. Utility piping systems.
  5. Plumbing piping systems.
  6. Culverts
  7. Methane Collection systems

B. Related Sections include but are not necessarily limited to:
  1. Division 1 - General Requirements.
  2. Section 02221 - Trenching, Backfilling, and Compacting for Utilities.
  3. Section 09905 - Painting and Protective Coatings.
  4. Section 10400 - Identification Devices.
  5. Section 11005 - Equipment: Basic Requirements.
  6. Section 13440 - Instrumentation for Process Control: Basic Requirements.
  7. Section 13442 - Field Instrumentation.
  8. Section 15065 - Pipe: High Density Polyethylene (HDPE).
  9. Section 15069 - Pipe: Stainless Steel (SST)
  10. Section 15100 - Valves: Basic Requirements.
  11. Section 15183 - Pipe, Duct, and Equipment Insulation.
  12. Section 16125 - Heat Tracing Cable.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
  1. American Association of State Highway and Transportation Officials (AASHTO):
    a. M36, Corrugated Steel Culverts and Underdrains.
    b. M190, Standard Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
    c. M252, Standard Specification for Corrugated Polyethylene Drainage Tubing.
    d. M278, Standard Specification for Class PS 46 Polyvinyl Chloride (PVC) Pipe.
    e. M294, Interim Specification for Corrugated Polyethylene Pipe 12 to 24 Inch Diameter.
  2. American National Standards Institute (ANSI):
    a. B16.5, Pipe Flanges and Flanged Fittings.
    b. B36.19, Stainless Steel Pipe.
    c. B40.1, Gauges - Pressure Indicating Dial Type - Elastic Element.
  3. American National Standards Institute (ANSI)/American Water Works Association (AWWA):
    a. ANSI/AWWA C110/A21.10, Ductile Iron and Gray Iron Fittings, 3 IN through 48 IN for Water and Other Liquids.
    b. ANSI/AWWA C115/A21.15, Flanged Ductile Iron Pipe with Threaded Flanges.
    c. ANSI/AWWA C151, Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sand-Lined Molds for Water or Other Liquids.
    d. ANSI/AWWA C153/A21.53, Ductile-Iron Compact Fittings, 3 IN Through 16 IN, for Water and Other Liquids.
  4. ASTM International (ASTM):
    a. C14, Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.

   - b. C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
   - c. C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
   - d. C443, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
   - e. D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
   - f. D4101, Standard Specification for Propylene Plastic Injection and Extrusion Materials.
   - g. F438, Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
   - h. F439, Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
   - i. F441, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- 5. Underwriters Laboratory, Inc. (UL).

B. Coordinate flange dimensions and drillings between piping, valves, and equipment.

1.3 SYSTEM DESCRIPTION

A. Piping Systems Organization and Definition:
- 1. Piping services are grouped into designated systems according to the chemical and physical properties of the fluid conveyed, system pressure, piping size, and system materials of construction.
- 2. Table A below defines each service classification, its symbol, and the designated system classification number of each service.

TABLE A. PIPING SERVICES

SYMBOL	SERVICE	SYSTEM
L	Leachate	HDPE/SST
G	Groundwater	HDPE/SST
STM	Stormwater	RCP/CMP/HDPE
PW	Potable Water	DI class 350
M	Methane Gas	HDPE

1.4 SUBMITTALS

A. See Section 01340 for administration of submittals.

B. Shop Drawings:
- 1. Fabrication and/or layout drawings:
   - a. Piping drawings (minimum scale 1 IN equals 10 FT) with information including:
      - 1) Pipe Dimensions, schedule, fittings, and supports.
      - 2) Invert or centerline elevations of piping crossings.
      - 3) Acknowledgement of bury depth and location requirements.
      - 4) Details of fittings, tapping locations, thrust blocks, restrained joint segments, harnessed joint segments, hydrants, and related appurtenances.
      - 5) Acknowledge designated valve or gate tag numbers, manhole numbers, instrument tag numbers, pipe, and line numbers.
      - 6) Line slopes.
   - b. Schedule of interconnections to existing piping and method of connection.
- 2. Product technical data including:
   - a. Acknowledgement that products submitted meet requirements of standards referenced.
   - b. Copies of manufacturer's written directions regarding material handling, delivery, storage and installation.

        c. Separate schedule sheet for each piping system scheduled in this Section showing compliance of all system components. Attach technical product data on gaskets, pipe, fittings, and other components.

C. Test Report:
   1. Copies of pressure test results on all piping systems.
   2. Reports defining results of dielectric testing and corrective action taken.
   3. Notification of time and date of piping pressure tests.

D. As-Built Drawings:
   1. As work progresses and again when work is complete, submit “As-Recorded” drawings of piping systems including project items and pre-existing items. Identify complete location, elevation, and description of piping systems. Relate piping systems to identified structures and appurtenances.

E. Operation and Maintenance Manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe coating during handling using methods recommended by manufacturer. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is not permitted.

B. Prevent damage to pipe during transit. Repair abrasions, scars, and blemishes. If repair of satisfactory quality cannot be achieved, replace damaged material immediately.

C. Store materials on site under protective coverings above ground to keep materials clean and dry.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Pipe saddles (for gage installation):
      a. Dresser Style 91 (steel and ductile iron systems).
      b. Dresser Style 194 (non-metallic systems).

B. Submit requests for substitution in accordance with Specification Section 01630.

2.2 COMPONENTS AND ACCESSORIES

A. Reducers:
   1. Furnish appropriate size reducers and reducing fittings to mate pipe to equipment connections. Connection size requirements may change from those shown on Drawings depending on equipment furnished.

B. Protective Coating and Lining:
   1. Include pipe, fittings, and appurtenances where coatings, linings, paint, tests and other items are specified.
   2. Field paint pipe in accordance with Section 09905.

C. Underground Warning Tape:
   1. See Section 10400.

D. Pressure Gages:
   1. See Section 11005 and Section 13442.

E. Valves:
   1. See Section 15100.

PART 3 - EXECUTION

3.1 EXTERIOR BURIED PIPING INSTALLATION

A. Unless otherwise shown on the Drawings, provide a minimum of 4 FT and maximum of 8 FT earth cover over exterior buried piping systems and appurtenances conveying water, fluids, or solutions subject to freezing.

B. Enter and exit through structure walls, floors, and ceilings by using penetrations and seals as shown on Drawings.

C. When entering or leaving structures or passing beneath the vertical projection of a structure wall use flexible joint piping with first joint installed within 2 FT of point where pipe enters or leaves structure. Install second joint not more than 6 FT nor less than 4 FT from first joint.

D. When entering or leaving structures with buried mechanical joint piping, install joint within 2 FT of point where pipe enters or leaves structure. Install second joint not more than 6 FT nor less than 4 FT from first joint.

E. Install expansion devices as necessary to allow expansion and contraction movement.

F. Laying Pipe in Trench:
   1. Excavate and backfill trench in accordance with Section 02221.
   2. Clean each pipe length thoroughly and inspect for compliance to Specifications.
   3. Grade trench bottom and excavate for pipe bell and lay pipe on trench bottom.
   4. Install gasket or joint material according to manufacturer's directions after joints have been thoroughly cleaned and examined.
   5. Except for first two joints, before making final connections of joints, install two full sections of pipe with earth tamped along side of pipe or final with bedding material placed.
   6. Lay pipe in only suitable weather with good trench conditions. Never lay pipe in water except where approved by Engineer.
   7. Seal open end of line with watertight plug if pipe laying stopped.
   8. Remove water in trench before removal of plug.

G. Anchorage and Blocking:
   1. Provide reaction blocking, anchors, joint harnesses, or other acceptable means for preventing movement of piping caused by forces in or on buried piping tees, wye branches, plugs, or bends.
   2. Place concrete blocking so that it extends from fitting into solid undisturbed earth wall. Concrete blocks shall not cover pipe joints.
   3. Provide bearing area of concrete in accordance with drawing detail.

H. Install underground hazard warning tape per Section 10400.

I. Install insulating components where dissimilar metals are joined together.

3.2 INTERIOR AND EXPOSED EXTERIOR PIPING INSTALLATION

A. Install piping in vertical and horizontal alignment as shown on Drawings.

B. Alignment of piping smaller than 4 IN may not be shown. However, install according to Drawing intent and with clearance and allowance for:
   1. Expansion and contraction.
   2. Operation and access to equipment, doors, windows, hoists, moving equipment.
   3. Headroom and walking space for working areas and aisles.
   4. System drainage and air removal.

C. Enter and exit through structure walls, floor, and ceilings using penetrations and seals as shown on the Drawings.

D. Install vertical piping runs plumb and horizontal piping runs parallel with structure walls.

E. Pipe Support:

1. Use methods of piping support as shown on Drawings.
2. Piping support systems for piping 12 IN and greater are shown on the Drawings. Support systems for piping smaller than 12 IN DIA are not necessarily shown on the Drawings. Contractor is responsible for design of these support systems.
3. Where pipes run parallel and at same elevation or grade, they may be grouped and supported from common trapeze-type hanger, provided hanger rods are increased in size as specified for total supported weight. The pipe in the group requiring the least maximum distance between supports shall set the distance between trapeze hangers.
4. Size pipe supports with consideration to specific gravity of liquid being piped.

F. Locate and size sleeves and castings required for piping system. Arrange for chases, recesses, inserts or anchors at proper elevation and location.

G. Use reducing fittings throughout piping systems. Bushings will not be allowed unless specifically approved.

H. Unions:
   1. Install in position which will permit valve or equipment to be removed without dismantling adjacent piping.
   2. Mechanical type couplings may serve as unions.
   3. Additional flange unions are not required at flanged connections.

I. Install expansion devices as necessary to allow expansion/contraction movement.

J. Provide full face gaskets on all systems.

K. Anchorage and Blocking:
   1. Block, anchor, or harness exposed piping subjected to forces in which joints are installed to prevent separation of joints and transmission of stress into equipment or structural components not designed to resist those stresses.

L. Equipment Pipe Connections:
   1. Equipment - General:
      a. Exercise care in bolting flanged joints so that there is no restraint on the opposite end of pipe or fitting which would prevent uniform gasket pressure at connection or would cause unnecessary stresses to be transmitted to equipment flanges.
      b. Where push-on joints are used in conjunction with flanged joints, final positioning of push-on joints shall not be made until flange joints have been tightened without strain.
      c. Tighten flange bolts at uniform rate which will result in uniform gasket compression over entire area of joint. Provide tightening torque in accordance with manufacturer's recommendations.
      d. Support and match flange faces to uniform contact over their entire face area prior to installation of any bolt between the piping flange and equipment connecting flange.
      e. Permit piping connected to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.
      f. Align, level, and wedge equipment into place during fitting and alignment of connecting piping.
      g. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.
      h. To provide maximum flexibility and ease of alignment, assemble connecting piping with gaskets in place and minimum of four bolts per joint installed and tightened. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment connecting flange. Realign as necessary, install flange bolts and make equipment connection.
      i. Provide utility connections to equipment shown on Drawings, scheduled or specified.

M. Provide insulating components where dissimilar metals are joined together.

N. Instrument Connections:
   1. See drawing details.

3.3 CONNECTIONS WITH EXISTING PIPING

A. Where connection between new work and existing work is made, use suitable and proper fittings to suit conditions encountered.

B. Perform connections with existing piping at time and under conditions which will least interfere with service to customers affected by such operation.

C. Undertake connections in fashion which will disturb system as little as possible.

D. Provide suitable equipment and facilities to dewater, drain, and dispose of liquid removed without damage to adjacent property.

E. Where connections to existing systems necessitate employment of past installation methods not currently part of trade practice, utilize necessary special piping components.

F. Once tie-in to each existing system is initiated, continue work continuously until tie-in is made and tested.

3.4 BUTT FUSION PROCEDURES

A. All HDPE pipe shall be joined using manufacturer’s recommended procedures except as specifically noted otherwise.

3.5 HEAT TRACING

A. See Section 16125 - Heat Tracing Cable.

3.6 PRESSURE GAGES

A. Provide at locations shown on the Drawings and as specified.

B. See Section 11005.

C. Acceptable manufacturers:
  1. Ashcroft
  2. Ametek.
  3. Red Valve.

D. Materials:
  1. Bourdon tube, socket, connecting tube: 316 stainless steel.
  2. Case: Phenolic.
  3. Diaphragm seal housing: 316 stainless steel.
  4. Pressure snubber:
     a. Filter disc: 316 stainless steel.
     b. Housing: 316 stainless steel.
  5. Accessories:
     a. Provide valve at point of connection to equipment.
     b. Utilize diaphragm seal to protect gauge from process liquid.
  6. Design and fabrication:
     a. All components suitable for service at 250 Deg F.
     b. Provide viewer protection from element rupture.
     c. Calibrate gages at jobsite for pressure and temperature in accordance with manufacturer’s instructions.
     d. Unless otherwise required by codes, provide stem mounted, as required, with dial diameter as follows:

PIPE SIZE	DIAL SIZE	GAGE CONNECTION
1-1/2 IN or less	2-1/2 IN	1/4 IN
Larger than 1-1/2 IN	4-1/2 IN	1/2 IN

     e. Equip with white faces, black numerals and black pointers.

        - f. Gage tapping position to be clear of equipment functions and movements, and protected from maintenance and operation of equipment. Gage to be readable from an accessible standing position.
        - g. Gage accuracy: 1 percent of full range.
        - h. Select gage range so that:
            - 1) The normal operating value is in the middle third of the dial.
            - 2) Maximum operating pressure does not exceed 75 percent of the full scale range.
    - 7. Provide at locations shown on the drawings and as specified.

3.7 FIELD QUALITY CONTROL

- A. Pipe Testing - General:
    - 1. Test piping systems as follows:
        - a. Test exposed, non-insulated piping systems upon completion of system.
        - b. Test exposed, insulated piping systems upon completion of system but prior to application of insulation.
        - c. Test concealed interior piping systems prior to concealment and, if system is insulated, prior to application of insulation.
        - d. Test buried piping after backfilling has been complete.
    - 2. Utilize pressures, media and pressure test durations as specified on Piping Specification Schedules.
    - 3. Isolate equipment which may be damaged by the specified pressure test conditions.
    - 4. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring equipment to determine leakage rates.
        - a. Select each gage so that the specified test pressure falls within the upper half of the gage's range.
        - b. Notify the Engineer 24 HRS prior to each test.
    - 5. Completely assemble and test new piping systems prior to connection to existing pipe systems.
    - 6. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance.
    - 7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.

- B. Pressure Testing:
    - 1. Testing medium: Unless otherwise specified in the Piping Specification Schedules, utilize the following test media.
        - a. Liquid systems:

PIPE LINE SIZE (DIA)	GRAVITY OR PUMPED	SPECIFIED TEST PRESSURE	TESTING MEDIUM
Up to and including 48 IN	Gravity	25 psig or less	Air or water
Above 48 IN	Gravity	25 psig or less	Water
All sizes	Pumped	200 psig or less	Water

    - 2. Allowable leakage rates:
        - a. Leachate systems, groundwater pumping systems, all exposed piping systems, all pressure piping systems, and all buried, insulated piping systems which are hydrostatically pressure tested shall have zero leakage at the specified test pressure throughout the duration of the test.
        - b. Hydrostatic exfiltration and infiltration for sanitary and stormwater sewers (groundwater level is below the top of pipe):
            - 1) Leakage rate: 200 GAL per inch diameter per mile of pipe per day at average head on test section of 3 FT.
            - 2) Average head is defined from groundwater elevation to average pipe crown.

3) Acceptable test head leakage rate for heads greater than 3 FT: Acceptable leakage rate (gallons per inch diameter per mile per day) = 115 x (actual test head to the 1/2 power).

c. Hydrostatic infiltration test for sanitary and stormwater sewers (groundwater level is above the top of pipe):
   1) Allowable leakage rate: 200 GAL per inch diameter per mile of pipe per day when depth of groundwater over top of pipe is 2 to 6 FT.
   2) Leakage rate at heads greater than 6 FT: Allowable leakage rate (gallons per inch diameter per mile of pipe per day) = 82 x (actual head to the 1/2 power).

d. For low pressure (less than 25 psig) air testing, the acceptable time for loss of 1 psig of air pressure shall be:

PIPE SIZE (IN DIA)	TIME, MINUTES/100 FT
2	0.2
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
33	5.4
36	6.0
42	7.3
48	7.6

3. Hydrostatic pressure testing methodology:
   a. General:
      1) All joints, including welds, are to be left exposed for examination during the test.
      2) Provide additional temporary supports for piping systems designed for vapor or gas to support the weight of the test water.
      3) Provide temporary restraints for expansion joints for additional pressure load under test.
      4) Isolate equipment in piping system with rated pressure lower than pipe test pressure.
      5) Do not paint or insulate exposed piping until successful performance of pressure test.
4. Air testing methodology:
   a. General:
      1) Assure air is ambient temperature.
   b. Low pressure air testing:
      1) Place plugs in line and inflate to 25 psig.
      2) Check pneumatic plugs for proper sealing.
      3) Introduce low pressure air into sealed line segment until air pressure reaches 4 psig greater than ground water that may be over the pipe.
         a) Use test gage conforming to ANSI B40.1 with 0 to 15 psi scale and accuracy of 1 percent of full range.
      4) Allow 2 minutes for air pressure to stabilize.
      5) After stabilization period (3.5 psig minimum pressure in pipe) discontinue air supply to line segment.
      6) Record pressure at beginning and end of test.
      7) Repeat test procedure for verification.

3.8 CLEANING, DISINFECTION AND PURGING

A. Cleaning:
  1. Clean interior of piping systems thoroughly before installing.
  2. Maintain pipe in clean condition during installation.
  3. Before jointing piping, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
  4. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system.

3.9 LOCATION OF BURIED OBSTACLES

A. Furnish exact location and description of buried utilities encountered and thrust block placement.

B. Reference items to definitive reference point locations such as found property corners, entrances to buildings, existing structure lines, fire hydrants and related fixed structures.

C. Include such information as location, elevation, coverage, supports and additional pertinent information.

D. Incorporate information on "As-Recorded" Drawings.

3.10 PIPE INSULATION

A. Insulate pipe and pipe fittings in accordance with Section 15183.

3.11 RELATION OF WATER MAINS TO SEWERS OR WASTE PIPING

A. Lateral Separation of Sewer and Water Mains, shall be laid at least 10 feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation, in which case:
  1. The water main is laid in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer; or
  2. The water main is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.

B. Crossing a Water Main over a Sewer. Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such elevation that the bottom of the water main at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18-inch vertical separation in which case both the water main and sewer shall be constructed of ductile iron pipe for distance of 10 feet on each side of the point of crossing.

C. Crossing a Water Main under a Sewer. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ductile iron pipe for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.

D. In the event 18 inches of vertical separation cannot be provided at a sewer crossing, the sewer shall be removed for a distance of 10 feet on each side of the water main and replaced with ductile iron pipe of the same size. Concrete collars shall be provided at each end of the ductile iron pipe to connect to the existing sewer pipe as shown on the Drawings. Payment for crossings shall be at the bid unit price, including concrete collars, removal, etc. constructed complete.

END OF SECTION

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SECTION 15064
PIPE: PLASTIC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic pipe.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Section 15060 - Pipe and Pipe Fittings: Basic Requirements.

1.2 QUALITY ASSURANCE

A. See Section 15060.

B. Referenced Standards:
   1. American Society for Testing and Materials (ASTM):
      a. Polyethylene (PE) materials:
         1) D638, Standard Test Method for Coefficient of Thermal Expansion of Plastics Between (-30°)C and 30°C.
         2) D2239, (PE) Plastic Pipe (SDR-PR) based on Inside Diameter.
         3) D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
         4) D3261, Standard Specification for Butt Fusion Polyethylene Plastics Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
         5) D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings.
         6) F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
      b. Installation:
         1) D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
         2) D2774, Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
   2. American National Standards Institute (ANSI):
      a. B36.10 standard dimensions of steel pipe (IPS).

1.3 SUBMITTALS

A. See Section 15060.

PART 2 - PRODUCTS

2.1 PRESSURE PIPING (UNDERGROUND)

A. Materials: Furnish materials in full compliance with following requirements:
   1. Materials and workmanship in accordance with ASTM F714.
   2. Pipe type and size as shown on Drawings, HDPE pipe to be SDR 11.
   3. Joints for polyethylene pipe shall be fusion type in accordance with AWWA C901.
   4. 4-12 IN: AWWA C900 PVC with Pressure Class of 150 psi per Table 2, AWWA C900.
   5. Joints for PVC pipe shall be the elastometric gasket type with a pressure rating not less than pipe pressure rating meeting performance requirements of ASTM D3139.

B. Installation: Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer's printed recommendations and in full observance to plan details when more stringent.

C. Uniformity: Ensure that all piping and fittings are integrated into components of the finished system. Utilize products of a single manufacturer.

2.2 HIGH DENSITY POLYETHYLENE PIPING (HDPE)

A. Approved Pipe Manufacturers
   1. Performance Pipe, a Division of Chevron Phillips Chemical Co.
   2. CSR Polypipe.

B. The pipe shall contain no recycled compound except that generated in the manufacturer’s own plant from resin of the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

C. The pipe will be extruded from resin meeting the specifications of ASTM D3350 with a minimum cell classification of 345434C.

D. Size and type as shown on Drawings.

2.3 HDPE FITTINGS

A. HDPE fittings shall be in accordance with ASTM D361 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this Specification. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.

B. All hardware to be stainless steel.

C. Flange dimensions bolt spacing and hardware size vary by pipe diameter per ANSI Standards.

2.4 PIPE MARKING

A. During extrusion production, the HDPE pipe shall be continuously marked with durable printing including the following information:
   1. Nominal size.
   2. Dimension ratio.
   3. Manufacturer name and product series.
   4. Cell classification.
   5. ASTM basis.
   6. Pipe test category.
   7. Plant identification.
   8. Production date.

2.5 PERFORATED PIPE

A. HDPE pipe requiring perforations shall conform to specified pattern size and spacing shown on the Drawings. The Contractor may submit alternate patterns or spacings that provide equivalent flow and function for Engineer’s review.

2.6 PVC PIPE

A. PVC pipe shall be manufactured from unplasticized polyvinyl chloride (PVC) compound conforming to ASTM D1784. The pipe shall be approved for conveying potable water by the National Sanitation Foundation and shall bear its seal of approval on each component of the PVC piping system.

B. Fittings: All fittings shall be manufactured from ductile iron except for pipe sizes for which ductile iron fittings are not manufactured. PVC fittings shall conform to ASTM D2464.

C. Length: Standard laying lengths shall be 20 feet for all sizes. At least 95 percent of the total footage of pipe of any class and size shall be furnished in standard lengths. The remaining 5 percent may be furnished in random lengths, provided that random lengths are not less than 10 feet long. Each standard and random length of pipe shall be tested to four times the class pressure of the pipe for a minimum of 5 seconds. The integral bell must be tested with the pipe.

D. Installation: Field threading of PVC pipe will not be permitted. Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer’s printed recommendations and in full observance to plan details when more stringent.

E. Uniformity: Ensure that all pipe and fittings are integrated into components of the finished system. Utilize products of a single manufacturer.

PART 3 - EXECUTION

3.1 PIPE PACKAGING, HANDLING, AND STORAGE

A. The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to ensure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.

B. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer’s recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.

C. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

D. Fused segments of pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

3.2 JOINING

A. Sections of polyethylene pipe shall be joined by the butt fusion process into continuous lengths at the job site. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer’s recommendations. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer.

B. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe where shown in details. Refer to the manufacturer’s recommendations.

3.3 CONSTRUCTION PRACTICE

A. Trench Construction
   1. Trenching should be done in accordance with ASTM D2321, Section 6 and/or ASTM D 2774.
   2. Embedment materials should be Class I, Class II, or Class III materials as defined by ASTM D2321, Section 5. The use of Class IV and Class V materials for embedment is not acceptable. Class I crushed stone and Class II well-graded gravels are required. The embedment material shall have an installed density of at least 95% Standard Proctor Density through compaction or consolidation.
   3. The pipe bedding should be constructed in accordance with ASTM D2321, Section 5, Table 2.

3.4 QUALITY AND WORKMANSHIP

A. Pipe which has been tested and falls outside of the appropriate limits set forth in this Specification will be cause for rejection.

3.5 CLEANING

A. General Cleaning:
   1. Clean interior of piping systems thoroughly of foreign matter before installing. Maintain pipe in clean condition during installation.
   2. Before jointing pipe, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.
   3. Immediately prior to pressure testing of piping systems, clean and remove grease, dirt or other foreign materials which may have entered the system.
   4. Upon completion of work and prior to final acceptance, thoroughly clean work installed under these specifications. Clean pipe, valves and fittings of debris which may have accumulated by operation of system, from testing or from other causes.

3.6 TESTING AND INSPECTION

A. Perform testing and inspection prior to cleaning and final acceptance. Acknowledge satisfactory performance of test and inspections in writing of CQA Consultant prior to final acceptance.

B. Types of testing and inspection to be employed for the piping systems include: Low Pressure Air Test unless otherwise approved by the Project Manager and CQA Consultant. Water should be used for testing all pressure piping unless otherwise approved by the project manager and CQA consultant.

C. Test and inspect all pipe, fittings, and joints. Provide all necessary equipment and perform all work required in connection with the tests and inspections.

D. Bear the cost of all testing and inspecting, locating and remedying of Leaks, and any necessary retesting and re-examination.

E. Refer to Section 15060, Paragraph 3.7-B for low pressure test requirements.

3.7 IDENTIFICATION

A. Identify each length of PVC pipe clearly at intervals of 5 FT or less. Include manufacturer’s name and trademark. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications, and “NSF” approvals when applicable.

END OF SECTION

SECTION 15100

VALVES - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Valving, actuators, and valving appurtenances.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Section 09905 - Painting and Protective Coatings.
   3. Section 11005 - Equipment: Basic Requirements.
   4. Section 15060 - Pipe and Pipe Fittings: Basic Requirements.
   5. Section 15065 - Pipe: High Density Polyethylene (HDPE).
   6. Section 15069 - Pipe: Stainless Steel
   7. Section 15101 - Gate Valves.
   8. Section 15104 - Ball Valves.
   9. Section 15106 - Check Valves.
   10. Section 15114 - Miscellaneous Valves.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American National Standards Institute (ANSI):
      a. B1.20.1, Pipe Threads, General Purpose.
      b. B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
      c. B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
      d. B16.34, Valves-Flanged, Threaded and Welding End.
   2. ASTM International (ASTM):
      a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
      b. D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
      c. D638, Standard Test Method for Tensile Properties of Plastics.
      d. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load.
      e. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
      f. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
   3. American Water Works Association (AWWA):
      a. C111, Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
      b. C207, Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through 144 IN.
      c. C500, Gate Valves for Water and Sewerage Systems.
      d. C504, Rubber-Seated Butterfly Valves.
      e. C507, Ball Valves, 6 IN through 48 IN (150 MM through 1200 MM).
      f. C509, Resilient-Seated Gate Valves 3 through 12 NPS, for Water and Sewage Systems.
      g. C540, Power-Actuating Devices for Valves and Sluice Gates.
      h. C550, Protective Epoxy Interior Coatings for Valves and Hydrants.
      i. C606, Grooved and Shouldered Joints.
   4. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
   5. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volt Maximum).
      b. MG 1, Motors and Generators.

1.3 SUBMITTALS

- A. Shop Drawings:
    - 1. See Section 01340.
    - 2. Product technical data including:
        - a. Acknowledgement that products submitted meet requirements of standards referenced.
        - b. Manufacturer's installation instructions.
        - c. Valve pressure and temperature rating.
        - d. Valve material of construction.
        - e. Special linings.
        - f. Valve dimensions and weight.
        - g. Valve flow coefficient.
        - h. Wiring and control diagrams for electric or cylinder actuators.
    - 3. Test reports.
- B. Operation and Maintenance Manuals:
    - 1. See Section 01340.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Refer to individual valve specification sections.

2.2 MATERIALS

- A. Refer to individual valve specification sections.

2.3 VALVE ACTUATORS

- A. Valve Actuators - General:
    - 1. Provide actuators as shown on Drawings or specified.
    - 2. Counter clockwise opening as viewed from the top.
    - 3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
    - 4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum pressure rating of the valve provided and withstand without damage a pull of 200 LB on handwheel or chainwheel or 300 foot-pounds torque on the operating nut.
    - 5. Unless otherwise specified, actuators for valves to be buried, submerged or installed in vaults or manholes shall be sealed to withstand at least 20 FT of submergence.
    - 6. Extension Stem:
        - a. Install where shown or specified.
        - b. Solid steel with actuator key and nut, diameter not less than stem of valve actuator shaft.
        - c. Pin all stem connections.
        - d. Center in valve box or grating opening band with guide bushing.
- B. Buried Valve Actuators:
    - 1. Provide screw or slide type adjustable cast iron valve box, 5 IN minimum diameter, 3/16 IN minimum thickness, and identifying cast iron cover.
    - 2. Box base to enclose buried valve gear box or bonnet.
    - 3. Provide 2 IN standard actuator nuts complying with Section 3.16 of AWWA C500.
    - 4. Provide at least two teehandle keys for actuator nuts, with 5 FT extension between key and handle.
    - 5. Extension Stem:
        - a. Provide for buried valves greater than 4 FT below finish grade.
        - b. Extend to within 6 IN of finish grade.

6. Provide concrete pad encasement of valve box as shown for all buried valves unless shown otherwise.

C. Plastic Valve Vault:
   1. Provide in non traffic areas as shown.
   2. Rectangular shape with snap lock lid.
   3. Minimum inside dimension: 9-1/8 IN.
   4. Injection molded polyolefin compound with fibrous inorganic component reinforcing with following minimum strength characteristics:

	ASTM TEST CRITERIA
Tensile: 3,400 psi	D638
Compressive: 3,350 psi	D695
Impact Strength, Izod: 0.6 FT LB/IN	D256
Durometer Hardness, Type D: 60	D2240
Deflection temp @ 66 psi: 230 DegF	D648

   5. UV degradation stabilized.
   6. Ametek Plymouth Products, or equal.

D. Exposed Valve Manual Actuators:
   1. Provide for all exposed valves not having electric or cylinder actuators.
   2. Provide handwheels for gate and globe valves.
      a. Size handwheels for valves in accordance with AWWA C500.
   3. Provide lever actuators for plug valves, butterfly valves and ball valves 3 IN DIA and smaller.
      a. Lever actuators for butterfly valves shall have a minimum of 5 intermediate lock positions between full open and full close.
      b. Provide at least two levers for each type and size of valve furnished.
   4. Gear actuators required for plug valves, butterfly valves, and ball valves 4 IN DIA and larger.
   5. Gear actuators to be totally enclosed, permanently lubricated and with sealed bearings.

E. Electric Actuators (480 V, 3 phase):
   1. Provide electric valve actuators with integral control devices and a remote pushbutton station.
   2. Furnish electric actuator integral with valve consisting of:
      a. Motor.
      b. Gearing.
      c. Handwheel.
      d. Limit and torque switches.
      e. Lubricants.
      f. Heating elements.
      g. Wiring.
      h. Terminals for motor power and controls.
      i. Drive nut.
   3. Housing/Enclosure:
      a. Provide cast iron gear housing and cast iron load bearing enclosure.
      b. Nonload bearing enclosure and housing: aluminum or cast iron.
      c. Rated for area classification shown on Drawings.
      d. Provide O-ring seals for covers and entries.
      e. Terminal and limit switch compartment covers are to be fastened to gear housing by stainless steel fasteners with capture device to prevent loss.

4. Motors:
    a. Provide motors that are totally enclosed, high torque design made expressly for valve actuator service and capable of operating the valve under full differential pressure for complete open-close and reverse cycle of travel at least twice in immediate succession without overheating.
    b. Design motors in accordance with NEMA MG 1 standards, with Class B insulation, and to operate successfully at any voltage within 10 percent above or below rated voltage.
    c. Provide positive method to ensure motor bearings are permanently lubricated.
    d. Provide three thermal switches imbedded in windings:
        1) 120 degrees apart.
        2) Provide motor shutdown at high temperature.
    e. Motor housing:
        1) Aluminum or cast iron.
        2) Totally enclosed nonventilated with cooling fins.
    f. Provide motor capable of operating in any position.
    g. Provide motor sealed from gearcase to allow any mounting position.
    h. Provide motors suitable for 480 V, 3 phase, 60 Hz.
5. Gearing:
    a. Provide power gearing consisting of heat treated steel helical gears, carburized and hardened alloy steel worm, and alloy bronze worm gear, all grease or oil bath lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter.
    b. Provide gearing mechanism constructed to permit field changes of reduction gear ratio.
    c. Design actuators so that motor comes up to speed before stem load is encountered in either opening or closing operation.
    d. Limit switch gearings and feedback device reduction gearing:
        1) Steel or bronze.
    e. Support rotating shafts with anti-friction bearings.
    f. Provide separate drive nut/thrust bearing assembly:
        1) Mounted to base of actuator.
        2) High tensile bronze.
        3) Quarter turn actuator: Provide 90 degree mounting intervals.
        4) Provide grease fitting on drive assembly.
6. Handwheel:
    a. Permanently attached for manual operation.
    b. Positive declutch mechanism to engage and disengage handwheel.
    c. Handwheel shall not rotate during motor operation.
    d. Inoperable motor shall not prevent manual operation.
7. Limit torque and thrust loads in both closing and opening directions by torque limit switches.
    a. Provide torque switches with micrometer adjustment and reference setting indicator. Assure adjustment variation of approximately 40 percent in torque setting.
    b. Provide switches having rating of not less than 6 A at 120 Vac and 2.2 A at 115 Vdc.
    c. Limit and torque switches shall have totally sealed contacts.
8. Furnish electric actuator with two geared limit switch assemblies with each switch assembly having four separate limit switches:
    a. Assure each limit switch assembly is geared to driving mechanism and is independently adjustable to trip at any point at and between the fully open and fully closed valve position.
    b. Provide minimum of two normally open contacts and two normally closed contacts at each end of valve travel.
    c. Provide switches with inductive contact rating of not less than 6 A at 120 Vac, 3 A at 240 Vac, 1.5 A at 480 Vac, 2.2 A at 115 Vdc and 1.1 A at 230 Vdc.
    d. Limit switches shall be fully adjustable when power is applied to actuator.

9. Provide space heating elements sized to prevent condensation in both motor and geared limit switch compartment(s).
    a. Furnish heating elements rated at 120 Vac with heaters continuously energized.
10. Open-close actuator controls:
    a. Provide control assembly with necessary holding relays, reversing starter, control transformers of sufficient capacity to provide control power, space heating element power and valve position transmitter.
    b. Provide control assembly in an enclosure rated for the defined area classification.
    c. Controls for open/close actuator:
        1) Provide prewired NEMA 4 stainless steel remote pushbutton station enclosure with:
            a) Open pushbutton.
            b) Close pushbutton.
            c) Stop pushbutton.
            d) Remote/local switch.
            e) Full open light.
            f) Full close light.
            g) Open and close relays as required.
        2) Provide control enclosure to accept:
            a) Remote open/close switches.
        3) Provide contacts in control enclosure:
            a) Remote/local contact.
            b) Full open contact.
            c) Full close contact.
        4) Wire all components to an internal terminal strip and include mounted wiring diagram inside enclosure.
11. Additional requirements for modulating valve actuators:
    a. Proportional position servo-amplifier mounted integral with the actuator control compartment.
    b. Positioning of valve shall be proportional to a 4-20 mA signal input to the position servo-amplifier when remote control has been selected.
    c. Servo-amplifier adjustments shall include zero, span, gain, and dead-band.
    d. Provide 4-20 mA signal position control as shown on the drawings that interfaces with the position control/position feedback instrumentation wiring to and from {remote control device} {PLC}.

F. Electric Actuators (120V, 1 phase):
1. General:
    a. Self contained including motor, gearing, torque switch, limit switches and cast housing.
    b. Electrical enclosure: NEMA 4 or NEMA 7 to comply with area rating classification shown on Drawings.
    c. Factory assembled requiring only field connection of power and control wires.
    d. Comply with Section 11005.
2. Motors:
    a. Produce 1.5 times the required torque.
    b. Sized for two complete open-close cycles without overheating.
    c. One fully closed to fully open cycle to occur within 60 SEC.
    d. Class F insulation.
    e. Operate at plus or minus 10 percent voltage.
    f. 120 Volt, single phase, 60 Hz.
    g. Provide thermal cutout switch and internal heater for actuator enclosure.
    h. Control wiring as shown on Drawing control diagrams.
3. Remote Pushbutton Station:
    a. Enclosure: NEMA 4 stainless steel.
    b. Control relays shall include:
        1) Open relay.

        2) Closed relay.
        3) {Remote control device} {PLC} interface relay.
    c. Push-to-test indicating lights shall include:
        1) Open.
        2) Closed.
        3) Remote.
    d. Selector switches shall include:
        1) Local-Remote.
        2) Open-Close.
    e. Space heater for enclosure.
    f. Control wiring as shown on control diagrams.
    g. Wire all components to an internal terminal strip and include mounted wiring diagram inside enclosure.

2.4 FABRICATION

A. End Connections:
  1. Provide the type of end connections for valves as required in the Piping Schedules presented in Section 15060 or as shown on the Drawings.
  2. Comply with the following standards:
      a. Threaded: ANSI B1.20.1.
      b. Flanged: ANSI B16.1 Class 125 unless otherwise noted or AWWA C207.
      c. Grooved: Rigid joints per Table 5 of AWWA C606.

B. Refer to individual valve sections for specifications of each type of valve on Project.

C. Nuts, Bolts, and Washers:
  1. To be stainless steel.

D. On Insulated Piping: Provide valves with extended stems to permit proper insulation application without interference from handle.

E. Epoxy Interior Coating:
  1. Provide epoxy interior coating for all ferrous surfaces in accordance with AWWA C550.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Painting Requirements:
  1. Comply with Section 09905 for painting and protective coatings.

C. Setting Buried Valves:
  1. Locate valves installed in pipe trenches where buried pipe indicated on Drawings.
  2. Set valves and valve boxes plumb.
  3. Place valve boxes directly over valves with top of box being brought to surface of finished grade.
  4. Install in closed position.
  5. Place valve on firm footing in trench to prevent settling and excessive strain on connection to pipe.
  6. After installation, backfill up to top of box for a minimum distance of 4 FT on each side of box.

D. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads being transferred to valve and valve loads being transferred to the piping.

E. For grooved coupling valves, install rigid type couplings {or provide separate support to prevent rotation of valve from installed position}.

F. Install electric or cylinder actuators above or horizontally adjacent to valve and gear box to optimize access to controls and external handwheel.

G. For threaded valves, provide union on one side within 2 FT of valve to allow valve removal.

H. Install valves accessible for operation, inspection, and maintenance.

3.2 ADJUSTING

A. Adjust valves, actuators and appurtenant equipment to comply with Section 01650. Operate valve, open and close at system pressures.

END OF SECTION

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ATTACHMENT III-3
QA/QC Requirements

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CONSTRUCTION QUALITY ASSURANCE
AND
CONSTRUCTION QUALITY CONTROL PLAN

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
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Prepared by:

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August 2008

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PREFACE

This Construction Quality Assurance and Construction Quality Control Plan (CQA/CQC) was prepared to provide the Owner, Engineer, CQA Consultant, and the Contractor the means to govern the construction quality and to satisfy the environmental protection as required under current solid waste management regulations, utilizing state-of-the-art construction practices and testing to adequately document proposed construction activities.

The proposed construction, testing, and documentation procedures are intended to not only satisfy the minimum regulatory requirements, but to provide the necessary safeguards and provisions to a level commensurate with the potential environmental liability to be accepted by the Owner upon completion.

The roles of each party have been sufficiently defined and the level of responsibility explained such that the proposed liner system will be constructed in accordance with the design, the construction documented and respective components approved, and certified for acceptance.

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SECTION 1.0
GENERAL

1.1 INTRODUCTION

This Construction Quality Assurance and Construction Quality Control (CQA/CQC) Plan has been prepared to provide the Owner, Engineer, CQA Consultant, the Contractor, and the Geosynthetics Installer the means to govern the construction quality and to satisfy the environmental protection requirements under current solid waste management regulations.

More specifically, this CQA/CQC Plan addresses the soils and geosynthetics components of the liner system. The liner system, as referenced herein, consists of a soil subgrade, a composite liner and a protective cover system. The composite liner from bottom to top consists of a geocomposite underdrain, a 1-foot soil liner, a 40-mil geomembrane, a geosynthetic clay liner, a 60-mil geomembrane, and a geocomposite leachate collection layer. The protective cover system overlying the geocomposite consists of a granular drainage material with perforated lateral collection piping. Descriptions of the components of the liner system are described herein.

The CQA/CQC Plan is divided into the following sections:

1.0 General
2.0 Surveying CQC
3.0 Soils CQA/CQC
4.0 Polyethylene Geomembranes CQA/CQC
5.0 Geotextile Material and Installation CQA
6.0 HDPE Manholes, Pipe, and Fittings CQA
7.0 Drainage Composite Installation CQA
8.0 Geosynthetic Clay Liner Installation CQA
9.0 Construction Quality Assurance Documentation

1.2 DEFINITIONS RELATING TO CONSTRUCTION QUALITY

1.2.1 Construction Quality Assurance and Construction Quality Control

This CQA/CQC Plan is devoted to construction quality assurance/quality control regarding the subgrade (or subbase) and soil component of the composite liner system and the construction quality assurance only for the synthetic components of the liner and leachate collection system. In the case of geosynthetics, CQC is provided by the manufacturers and installers of the various materials and conformance testing by an independent geosynthetic testing laboratory. The manufacturer's specifications and quality control requirements are included by reference only, and a complete updated version will be incorporated as part of this CQA/CQC Plan.

1.2.2 Use of the Terms in this CQA/CQC Plan

In the context of this document:

Construction Quality Assurance (CQA) refers to means and actions employed by the Owner to assure conformity of the liner system and protective cover system preparation, production, and installation with this CQA/CQC Plan, Contract Drawings, and the project technical specifications. CQA is provided by the CQA Consultant as a representative of the Owner and independent from manufacture, fabrication, construction, and installation.

Construction Quality Control (CQC) refers to those actions taken by manufacturers, fabricators, installers, Quality Control Agency, or Contractor to ensure that the materials and the workmanship meet the requirements of this CQA/CQC Plan and the project technical specifications. In the case of soils, CQC is provided by the Contractor's CQC Agency. In the case of geosynthetics, CQC is provided by the manufacturers and installers of the various geosynthetics. The manufacturer's specifications and quality control requirements are included by reference only and a complete updated version will be incorporated as part of this CQA/CQC Plan.

1.2.3 Discrepancies Between Documents

The CQA/CQC Plan is intended to be a supporting document to improve the overall implementation of the work. The CQA/CQC Plan may be more or less specific than the project technical specifications, and conflicts may exist between the documents. The Contractor is instructed to bring discrepancies to the attention of the Engineer or CQA Consultant for resolution.

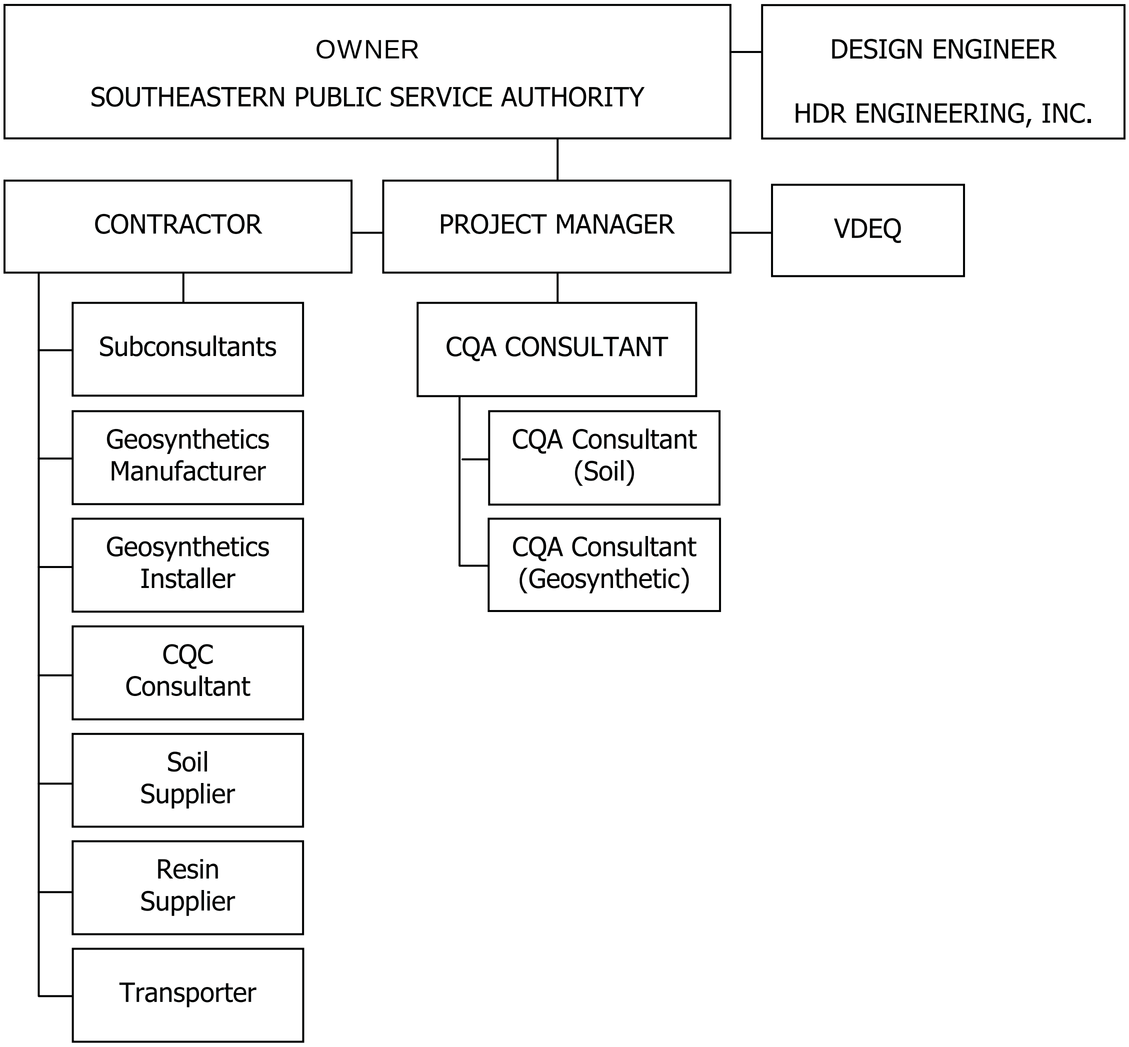
The Engineer has the sole authority to determine resolution of discrepancies existing within the Contract Documents. Unless otherwise determined by the Engineer, the more stringent requirement shall be the controlling resolution.

1.3 PARTIES TO CONSTRUCTION QUALITY ASSURANCE

1.3.1 Description of the Parties

The parties to Construction Quality Assurance and Quality Control include the Owner, Project Manager, Engineer, Contractor, Soils Supplier, Resin Supplier, Geosynthetics Fabricator, Geosynthetics Installer, Transporter, CQA Consultant, CQC Agency, Geosynthetics CQA Laboratory, and Soils CQA Laboratory. The lines of authority and communications between each of the parties involved in the CQA and CQC are illustrated in Figure 1.

FIGURE 1
LINES OF COMMUNICATION



1.3.1.1 Engineer

The Engineer is responsible for the engineering design, drawings, plans and project technical specifications for the liner system and protective cover system.

1.3.1.2 Contractor

The Contractor is generally responsible for the construction of the subgrade, construction of the subbase (as applicable), soil liner replacement, berms, anchor trench excavation and backfill, and may also be responsible for placement of the protective cover system. The Contractor is responsible for submittal coordination and the overall construction quality control on the project.

1.3.1.3 Soils Supplier

The Soils Supplier is a subcontractor of the Contractor which excavates and delivers soils to the project site.

1.3.1.4 Resin Supplier

The Resin Supplier produces and delivers the resin to the geosynthetics manufacturer(s).

1.3.1.5 Geosynthetics Manufacturer

The Geosynthetics Manufacturer(s) is responsible for the production of geomembranes, geotextiles, drainage composites and geosynthetic clay liners (GCL). The manufacturers of the individual components will be referred to as Geosynthetic Manufacturers, etc.

1.3.1.6 Geosynthetics Installer

The Geosynthetics Installer(s) is a subcontractor of the Contractor and is responsible for field handling, storing, placing, seaming, loading (against wind), and other aspects of the geosynthetics installations, including the geomembranes and geotextiles. The Installer may also be responsible for transportation of these materials to the site, and for the preparation and completion of anchor trenches.

1.3.1.7 Transporter

The Transporter transports the geosynthetics, including rolls or factory panels of, geomembranes and geotextiles between the manufacturing plant and the site, and/or between the manufacturing plant and the fabrication plant, and/or between the fabrication plant and the site.

1.3.1.8 Construction Quality Assurance Consultant

The CQA Consultant is a party, independent from the Contractor, Geosynthetic Manufacturer(s), and Geosynthetic Installer(s), that is responsible for observing, testing, and documenting activities related to the CQA of the earthworks at the site, and the production and installation of the geosynthetic components of the liner, leachate collection/ detection, and protective cover systems. The CQA Consultant is also responsible for issuing a certification report, sealed by a Professional Engineer registered in the State of Virginia.

1.3.1.9 Geosynthetics Construction Quality Assurance Laboratory

The Geosynthetics CQA Laboratory is a party, independent from the Owner, Manufacturer(s), and Installer(s), that is responsible for conducting tests on samples of geosynthetics used in the liner system. The Geosynthetics CQA Laboratory service cannot be provided by any party involved with the manufacture, or installation of any of the geosynthetic components.

1.3.1.10 Construction Surveyor

The Construction Surveyor, also referred to as the CQC Surveyor, is a subcontractor of the Contractor and responsible for all stakeout and survey control as outlined in Section 2.0, Surveying Construction Quality Control.

1.3.1.11 Construction Quality Control Agency

The CQC Agency is a representative of the Contractor and responsible for the geosynthetic materials and soils quality control sampling and testing.

1.3.1.12 Owner

The Owner is the Southeastern Public Service Authority (SPSA), who owns and is responsible for the facility.

1.3.1.13 Project Manager

The Project Manager is the official representative of the Owner. In this CQA/CQC Plan, the term "Project Manager" will apply equally to "Construction Coordinator" or Owner's Representative, i.e., the individual or company in charge of coordinating construction activities on behalf of the Owner.

1.3.2 Qualifications of the Parties

The following qualifications are required of all parties involved with the design, manufacture, fabrication, installation, transportation, and CQA of all materials for the liner system and protective cover system. These qualifications must be submitted to the Project Manager for review and approval.

1.3.2.1 Engineer

The Engineer should be a qualified engineer, registered as required by regulation. The Engineer should have a history which demonstrates familiarity with geosynthetics and soils, as appropriate, including detailed design methods and procedures.

1.3.2.2 Contractor

Qualifications of the Contractor are specific to the construction contract and independent of this CQA/CQC Plan. It is the Contractor's responsibility to ensure that the geosynthetics and soils used meet the project technical specifications.

1.3.2.3 Geosynthetics Manufacturers

The Geosynthetics Manufacturers will be able to provide sufficient production capacity, ensure quality of the resins, and provide qualified personnel to meet the demands of the project. The Geomembrane Manufacturer, in particular, will be prequalified and approved by the Owner or his appointed representative. The qualifications presented by the Geomembrane Manufacturer will, as a minimum, include:

- Manufacturing capabilities:
- daily production quantity available for this contract;
- quality control manual for manufacturing; and
- list of material properties including certified test results, to which are attached geomembrane samples.
- A list of at least 10 completed facilities totaling a minimum of 5,000,000 ft2, for which the Manufacturer has manufactured a geomembrane of the same material to be used for this project. For each facility, the following information will be provided:
- name and purpose of facility, its location, and date of installation;
- name of Owner, Project Manager, Engineer, Fabricator (if any), and Installer; and
- thickness of geomembrane, surface area of geomembrane manufactured.

1.3.2.4 Geosynthetics Installer

The Geosynthetics Installer(s) will be trained and qualified to install geosynthetics under the direction of the Geosynthetics Installation Superintendent. The Geomembrane Installer, in particular, will be approved and/or licensed by the Geomembrane Manufacturer and/or the Geomembrane Fabricator. A copy of the approval letter or license will be submitted by the Geomembrane Installer to the Project Manager. The Geomembrane Installer will be prequalified and approved by the Owner or his representative. Prior to confirmation of any contractual agreements, the Geomembrane Installer will provide the Project Manager with the following written information:

Installation capabilities:

- information on equipment and personnel;
- anticipated daily production;
- quality control manual for installation; and
- samples of field seams and certified test results.

Five years continuous experience totaling a minimum of 10,000,000 feet^2 for which the Geomembrane Installer has installed a geomembrane of the same material for this project.

For each installation, the following information will be provided:

- name and purpose of facility, its location, and date of installation;
- name of Owner, Project Manager, Engineer, Manufacturer, and Fabricator (if any);
- name and qualifications of the supervisor of the Geomembrane Installer's crew;
- thickness of geomembrane, surface area of the installed geomembrane;
- type of seams and/or type of seaming apparatus used; and
- duration of installation.

The Geomembrane Installer will provide the Project Manger with a list of proposed seaming personnel and their professional records. This document will be reviewed by the Project Manager and the CQA Consultant. Any proposed seaming personnel deemed insufficiently experienced will not be accepted by the Project Manager or will be invited to pass a seaming test.

The Geomembrane/Geosynthetic Installer will designate one representative as his Superintendent, who will represent the Geomembrane/Geosynthetic Installer at all site meetings and be responsible for acting as the Geomembrane/Geosynthetic Installer's spokesman on site. The Superintendent will be qualified by experience. The Superintendent must have supervised the installation of a minimum of 1,000,000 feet^2 of geomembrane, and 100,000 feet^2 of geotextiles, GCLs, and drainage composites. He should also exhibit good management skills. His appointment will be approved by the Project Manager.

1.3.2.5 Transporter

All personnel responsible for the loading, transport, and unloading of the geosynthetics must be fully aware of the consequences of damage to the geosynthetics, and familiar with handling and transport constraints required by the Geomembrane/Geosynthetic Manufacturers. The Transporter will ensure that all rolls of polyethylene geomembrane are shipped on open trailers (no enclosed vans) for ease and safety of unloading the material. Geotextiles may be transported in either open or enclosed trailers.

1.3.2.6 Construction Quality Assurance Consultant

The CQA Consultant will be a well-established, incorporated (or otherwise registered) engineering firm. The CQA Consultant will be experienced with soils, including high and low permeability soils, and geosynthetics, including geomembranes, geotextiles, drainage composites, and GCLs. The CQA Consultant will be experienced in CQA, including CQA of the installation of soils and geosynthetics. The CQA Consultant will be experienced in the preparation of CQA documentation including CQA forms, reports, certifications, and manuals.

In addition, the CQA Consultant will provide the following, in writing, to the Owner:

CQA capabilities:

- a summary of the firm's experience with soils, including high and low permeability soils, and geosynthetics; and
- a summary of CQA documentation and methods used by the firm, including sample CQA forms, reports, certifications, and manuals prepared by the firm.

The personnel of the CQA Consultant will include the CQA Managing Engineer (Certifying Engineer), CQA Manager, and CQA Observers. The CQA Managing Engineer must be registered as a professional engineer in the state in which the project is located. He will also comply with the experience requirements listed in the previous paragraph. The CQA

Manager(s) will be specifically experienced in the installation of soils and geosynthetics and will be trained and certified by the CQA Consultant in the duties of a CQA Manager. CQA observers will be CQA personnel who have been specifically trained in the CQA of soils and geosynthetics.

In addition, the CQA Consultant will provide the following, in writing, to the Owner:

- resumes of personnel to be involved in the project including CQA Managing Engineer, CQA Manager, and CQA Monitors;
- proof of Professional Engineering registration (or ability to be registered) of the Engineer to be designated the CQA Managing Engineer; and
- proof of CQA experience of CQA personnel in both soil and geosynthetics, particularly geomembranes.

1.3.2.7 Geosynthetics Construction Quality Assurance Laboratory

The Geosynthetics CQA Laboratory is a subcontractor of the CQA Consultant and will have experience in testing geosynthetics and be familiar with ASTM, GRI, and other applicable test standards. The Geosynthetics CQA Laboratory will be capable of providing test results within 24 hours or a reasonable time after, as agreed to at the outset of the project, receipt of samples, and will maintain that standard throughout the installation.

1.3.2.8 Construction Quality Control Agency

The CQC Agency will have experience in geotechnical aspects of landfill liner system construction and soils testing, meet all regulatory requirements, and be familiar with ASTM and other related industry standards. The CQC Agency will be capable of providing competent geotechnical inspections and judgments, proper sampling procedures, and providing test results in accordance with the project technical specifications.

1.4 SCOPE OF CQA AND CQC

The scope of this CQA/CQC Plan includes the CQA and CQC of the soils and geosynthetic components of the liner system and protective cover system proposed for the subject facility. The CQA and CQC for the selection, evaluation, and placement of the soils is included in the scope. The CQA applicable to manufacturing, shipping, handling, and installing of all geosynthetics is also included. This document is intended to be used in concert with the project technical specifications regarding which party is to provide testing services and the frequency of testing.

1.5 UNITS

In this CQA/CQC Plan, all properties and dimensions are expressed in U.S. units.

1.6 REFERENCES

The CQA/CQC Plan includes references to the most recent version of the test procedures of ASTM International (ASTM), and the Geosynthetics Research Institute (GRI).

1.7 SITE AND PROJECT CONTROL

To guarantee a high degree of quality during installation, clear, open channels of communication are essential. To that end, meetings are critical.

1.7.1 Resolution Meeting

Following the completion of the design, plans, and project technical specifications for the project, a resolution meeting will be held. This meeting will include all parties then involved, including the CQA Consultant, Engineer, Contractor, CQC Agency, and Project Manager.

The purpose of this meeting is to begin planning for the coordination of tasks, anticipate any problems which might cause difficulties and delays in construction, and, above all, present the CQA/CQC Plan to all of the parties involved.

It is very important that the rules regarding testing, repair, etc., be known and accepted by all.

This meeting should include all of the following activities:

- communicate to all parties any relevant documents;
- review critical design details of the project;
- review the seam layout drawing provided by the Geomembrane/ Geosynthetic Installer;
- review the site-specific CQA/CQC Plan;
- make any appropriate modifications to the CQA/CQC Plan to ensure that it specifies all CQA activities that are necessary;
- reach a consensus on the CQA/CQC Plan and quality control procedures, especially on methods for determining acceptability of the soils and geosynthetics;
- review the proposed liner system and protective cover system;
- decide the number of spare seaming units for geomembranes to be maintained on site by the Geomembrane/Geosynthetic Installer (this number depends on the number of seaming crews and on the type of seaming equipment);
- select testing equipment and review protocols for testing and placement of general earthwork materials;
- confirm methods for the soil liner material selection testing, acceptable zone determinations, and test strip installation;
- confirm the methods for documenting and reporting, and for distributing documents and reports; and
- confirm the lines of authority and communication.

The meeting will be documented by a person designated at the beginning of the meeting, and minutes will be transmitted to all parties.

1.7.2 Preconstruction Meeting

A preconstruction meeting will be held at the site. At a minimum, the meeting will be attended by the Owner, Engineer, Geosynthetic/Geomembrane Installation Superintendent, CQA Consultant, Contractor, and Project Manager.

Specific topics considered for this meeting include:

- make any appropriate modifications to the CQA/CQC Plan;
- review the responsibilities of each party;
- review lines of authority and communication;
- review methods for documenting and reporting, and for distributing documents and reports;
- establish protocols for testing;
- establish protocols for handling deficiencies, repairs, and retesting;
- review the time schedule for all operations;
- establish rules for writing on the geomembrane, i.e., who is authorized to write, what can be written, and in which color;
- outline procedures for packaging and storing archive samples;
- review panel layout and numbering systems for panels and seams;
- establish procedures for use of the extrusion seaming apparatus, if applicable;
- establish procedures for use of the fusion seaming apparatus, if applicable;
- finalize field cutout sample sizes;
- review seam testing procedures;
- review repair procedures; and
- establish soil stockpiling locations (if any).

The meeting will be documented by a person designated at the beginning of the meeting, and minutes will be transmitted to all parties. The resolution meeting and the preconstruction meeting may be held as one meeting or separate meetings, depending on the direction of the project manager.

1.7.3 Daily and Weekly Progress Meetings

A weekly progress meeting will be held between the CQA Consultant, Geosynthetic/Geomembrane Installation Superintendent, Contractor, CQC Agency, Project Manager, representatives from any other involved parties. This meeting will discuss current progress, planned activities for the next week, and any new business or revisions to the work.

The CQA Consultant will log any problems, decisions, or questions arising at this meeting in their daily reports. Any matter requiring action which is raised in this meeting will be reported to the appropriate parties.

A daily meeting will be held between the CQA Consultant, Geosynthetic/Geomembrane Installation Superintendent, Contractor, Project Manager, representatives from any other involved parties. This meeting will discuss current progress, planned activities for the next shift, and any new business or revisions to the work. The CQA Consultant will log any problems, decisions, or questions arising at this meeting in his daily report. Any matter requiring action which is raised in this meeting will be reported to the appropriated parties.

Meeting frequency will depend on the schedule of the project and the mutual agreement of all parties involved.

1.7.4 Problem or Work Deficiency Meetings

A special meeting will be held when and if a problem or deficiency is present or likely to occur. At a minimum, the meeting will be attended by all interested parties, the Project Manager, and the CQA Consultant. If the problem requires a design modification, the Engineer should also be present. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:

- define and discuss the problem or deficiency;
- review alternative solutions; and
- implement an action plan to resolve the problem or deficiency.

The meeting will be documented by a person designated at the meeting and minutes will be transmitted to affected parties.

SECTION 2.0
SURVEYING CQC

2.1 INTRODUCTION

Surveying of lines and grades is conducted on an ongoing basis during construction of the composite liner and leachate collection systems. Close CQC of the surveying is absolutely essential to ensure that slopes are properly constructed. The surveying conducted at the site shall be performed by the Contractor.

2.2 SURVEY CONTROL

Permanent benchmarks and baseline control points are to be established for the site at locations convenient for daily tie-in. The vertical and horizontal controls for these benchmarks will be established within normal land surveying standards.

2.3 SURVEYING PERSONNEL

The Contractor's survey crew will consist of a Senior Surveyor, and as many Surveying CQC Monitors as are required to satisfactorily undertake the requirements for the work. All Surveying CQC personnel will be experienced in the provision of these services, including detailed, accurate documentation.

All surveying will be performed under the direct supervision of a Registered Professional Engineer (PE) or Licensed Land Surveyor (LLS) licensed in the state in which the project is located. The Licensed Land Surveyor may be the Senior Surveyor.

The CQA Consultant may provide spot checks on survey points at the project site. The CQA Consultant surveying will be provided under the direct supervision of a registered PE or LLS licensed in the state in which the project is located.

2.4 PRECISION AND ACCURACY

A wide variety of survey equipment is available to meet the requirements of this project. The survey instruments used for this work should be sufficiently precise and accurate to meet the needs of the project. All survey instruments should be capable of reading to a precision of 0.01 foot and with a setting accuracy of 20 seconds (5.6×10^{-3} degrees).

2.5 LINES AND GRADES

The following surfaces shall be surveyed to verify the lines and grades achieved during construction. The survey should at least include (as deemed appropriate by the Engineer and CQA Consultant):

- one or more construction baselines;

- a working grid with a sufficient number of benchmarks;
- surface of the subgrade;
- all existing structures;
- surface of the soil liner component;
- invert elevation of and location of underdrains, leachate collection/header and force main piping at each lateral intersection and endpoint, and every 50 feet between the intersections and endpoints;
- inverts of sumps and manholes;
- surface of the leachate collection layer (protective cover);
- elevations of and locations of temporary berms;
- top/toe of all perimeter berms, roads, and channels;
- location of edge of liner, tie-in seam to adjacent existing liner system (as applicable);
- corners/intersections of all geosynthetic rolls or panels; and
- location of anchor trenches.

Laser planes are highly recommended for achieving the correct lines and grades during construction of each surface.

2.6 FREQUENCY AND SPACING

All surveying will be carried out immediately upon completion of a given installation to facilitate progress and avoid delaying commencement of the next installation. In addition, spot checks, as determined by the Senior Surveyor, CQA Consultant, or Project Manager, during construction may be necessary to assist the Contractor in complying with the required grades.

The following spacings and locations will be provided by the CQC Surveyor, as a minimum, for survey points:

- surfaces with slopes less than 10 percent will be surveyed on a square grid not wider than 100 feet;
- on slopes greater than 10 percent, a square grid not wider than 100 feet will be used, but, in any case, a line of survey points at the crest, midpoint, and toe of the slope will be taken;
- a line of survey points no farther than 100 feet apart will be taken along any slope break (this will include the inside edge and outside edge of any bench on a slope);
- a line of survey points not farther than 50 feet apart will be taken for all piping used for underdrains and leachate collection/detection lines, in particular, at the lateral intersection and line end points;
- at a minimum, a line of survey points no farther than 50 feet apart will be taken for all cleanout risers;
- at a minimum, every 100 feet along the perimeter of the primary and secondary liner system; and

- at a minimum, a line of survey points no farther than 50 feet apart will be taken for all piping used for the leachate collection/detection lines.

2.7 THICKNESS MEASUREMENTS

The CQC surveyor as a representative of the Contractor shall obtain top and bottom elevations of the soil liner at a maximum 100-foot grid points and at all grade break lines prior to placement of the geomembrane liner system. The procedure for obtaining top and bottom elevations of the soil liner shall be agreed to by the CQA Consultant and Engineer prior to construction. The CQC Surveyor shall review the survey information with the Contractor to ensure that the survey demonstrates compliance with the project technical specifications.

The Contractor is responsible for identifying and reporting to the CQA Consultant any areas of non-compliance evidenced by the survey, and for repairing such areas. The CQA Consultant and Contractor shall review the thickness measurements of the soil liner component prior to placement of the geomembrane liner.

2.8 TOLERANCES

Except for liner components where no minus tolerances are acceptable, the following are maximum tolerances for survey points:

- on surfaces, the maximum tolerances shall be 0.2 foot. This tolerance must be set to the record elevation of the surface below it and not the design elevation;
- on piping for leachate collection/detection lines, the maximum tolerance shall be 0.02 foot. This tolerance must be set to the record elevation of the surface below it and not the design elevation; and
- on cleanout risers, the tolerance shall be 0.2 foot This tolerance must be set to the record elevation of the surface below it and not the design elevation.

2.9 DOCUMENTATION

All field survey notes will be retained by the Senior Surveyor. The results from the field surveys will be documented on a set of Survey Record (As-Built) Drawings for submittal to the CQA Consultant. The Contractor shall certify to the CQA Consultant and Engineer that the results of the survey demonstrates compliance with the Contract Documents. These drawings shall, at a minimum, show the final elevations and locations of all surfaces and appurtenances surveyed in Subsection 2.5 of this CQA/CQC Plan.

SECTION 3.0

SOILS CQA and CQC

3.1 INTRODUCTION

This section of the CQA/CQC Plan addresses the soils components of the liner system, and outlines the soils CQA/CQC program to be implemented with regard to materials selection and evaluation, laboratory test requirements, field test requirements, and treatment of problems.

3.2 EARTHWORK CONSTRUCTION

3.2.1 Subgrade

The subgrade material below the controlled fill will be prepared by the Contractor prior to the placement of fill. The CQA Consultant will provide density testing of the pre-fill subgrade at the frequency specified in the project technical specifications and also observe the proofroll by Contractor.

3.2.2 Structural/Controlled Fill

The Contractor shall place fill in accordance with the project technical specifications. The CQA Consultant shall provide testing of the controlled fill material in accordance with the project technical specifications. The CQA Consultant will provide confirmatory testing of the controlled fill as deemed appropriate.

3.3 SOIL LINER SYSTEM AND GRANULAR LEACHATE COLLECTION/BUFFER LAYERS (PROTECTIVE COVER)

3.3.1 Soil Liner System

3.3.1.1 Soil Liner Subgrade

Testing will be conducted by the CQA Consultant. The subgrade material below the subbase is composed of controlled fill and in situ soils. The surface of the subgrade will be prepared prior to the construction of the subbase. The CQA Consultant will visually examine the surface of the subgrade to verify that any potentially deleterious materials have been removed.

3.3.1.2 Soil Liner Material

The soil liner material shall be placed and compacted in accordance with the project technical specifications. The CQA Consultant shall conduct field density and moisture testing at the frequency presented in the project technical specifications. Testing of the soil liner material shall be performed by the CQA Consultant in accordance with the project technical specifications. Survey thickness measurement shall be performed by the Contractor in accordance with Section 2.7.

3.3.1.3 Coarse Aggregate around Pipes

The coarse aggregate selected for placement around the pipes will be rounded, and will meet the gradation requirements of the project technical specifications.

3.2.1.4 Protective Cover (Leachate Collection) Layer

The protective cover (leachate collection) layer will be a 18-inch thick (minimum) layer of granular materials placed directly over the leachate collection drainage composite as per the project technical specifications.

The protective cover layer material will meet the gradation and general requirements defined in the project technical specifications. The target permeability for the protective cover layer material will be 1.2 x 10-4 cm/sec or greater. This target permeability may be adjusted by the Engineer or the CQA Consultant depending on the availability of suitable coarse aggregate material.

3.4 SOILS TESTING

3.4.1 Test Methods

All testing used to evaluate the suitability or conformance of soils materials will be carried out in accordance with the current version of the corresponding ASTM International (ASTM) test procedures. The test methods indicated in Tables 3-1 and 3-2 of this document are those which will be used for the soils CQA/CQC Plan.

TABLE 3- 1
LABORATORY TEST METHODS FOR THE EVALUATION OF SOIL AND AGGREGATE

COMMON TEST NAME	PARAMETER DETERMINED	ASTM STANDARD METHOD
Classification of Soils for Engineering Purposes	USCS Classification	D2487
Standard Proctor Density	Maximum Dry Unit Weight and Optimum Moisture Content	D698
Modified Proctor Density	Maximum Dry Unit Weight and Optimum Moisture Content	D1557
Moisture Content	Water to Dry Weight Ratio	D2216
Permeability: Flexible Wall Permeameter - Constant Head Method	Hydraulic Conductivity of Undisturbed or Recompacted Samples of Soil	D5084
Permeability: Rigid Wall Permeameter - Constant or Falling Head Methods	Hydraulic Conductivity of Aggregates	D2434
Ash Content by Loss on Ignition (LOI) at 750°C or 500°C	Percent Combustible/Coal	D2974

TABLE 3- 1 LABORATORY TEST METHODS FOR THE EVALUATION OF SOIL AND AGGREGATE		
COMMON TEST NAME	PARAMETER DETERMINED	ASTM STANDARD METHOD
Unconsolidated; Undrained Compressive Strength of Soils in Triaxial Compression	Shear Strength Parameters	D2850
Carbonate Content	Percent Carbonate	D3042

TABLE 3- 2 FIELD TEST METHODS FOR THE EVALUATION OF SOIL AND AGGREGATE		
Common Test Name	Parameter Determined	ASTM Standard Method
Visual Classification	Description and Identification of Naturally Occurring Soils (Visual-Manual Procedures)	D2488
USDA Classification	Classification of Ability to Support Vegetation	D2487
Nuclear Densometer	In-Place Density and In-Place Moisture Content	D2922, and D3017
Moisture Content	In-Place Moisture as Check on Nuclear Densometer Measurements	D2216
Drive Tube Sample	In-Place Density as Check on Nuclear Densometer Measurements	D2937
Lift Depth Check	Thickness of Placed Soil Material	Visual Confirmation
Particle Size	Grain-Size Distribution of Clays	D1140
Particle Size	Grain-Size Distribution of Others	D422
Atterberg Limits	Liquid Limit (LL), Plastic Limit (PL), and Plasticity Index (PI)	D4318
Sand Cone Density Method	Density and Moisture Content	D1556
Particle Angularity	Percentage of Aggregate with Angular Surfaces	D2488

3.4.2 Soils Testing Requirements

Nuclear density gage methods will be used for the field density and moisture content testing in most cases. Drive tube samples (ASTM D 2937) for laboratory testing or other tests can be used as verification or in cases where direct transmission testing is prohibited. Any conflict with the results will be resolved by the CQA Consultant.

The soil testing required for conformance and quality assurance testing must comply with the minimum frequencies as presented in the project technical specifications. The actual frequency of testing required will be determined by the CQA Consultant, in light of the potential variability of materials at the site. Likewise, the frequency of soils testing for construction quality assurance purposes may vary to suit field conditions and results obtained.

3.5 SOILS CQA AND CQC

CQA/CQC will be performed on all soil components of the construction. Construction evaluation testing will consist of (1) observing the work; and (2) laboratory and field tests. Laboratory tests will be conducted on samples taken at the borrow source, stockpile, and during the course of the work prior to construction. Field tests will be conducted during the course of the work.

3.5.1 Monitoring

The CQA Consultant shall observe and document the construction of all components. Monitoring the construction work for the subbase, the soil component of the liner system, and leachate collection layers includes the following:

CQA testing to determine the water content and other physical properties of the subbase and soil component of the liner system during compaction;

- observing the loose thickness of lifts as placed;
- observing the action of the compaction and/or heavy hauling equipment on the construction surface (i.e., penetration, pumping, cracking. etc.); and
- observing the number of passes used to compact each lift.

Monitoring the construction work for the leachate collection and buffer layer for the liner system includes the following:

- observing the thickness of lifts during placement of the materials on top of the primary liner;
- observing the final thickness of the layers and verifying the thickness with the design; and
- recording the construction equipment used for material placement.

Monitoring of the protective cover placement on all areas, in particular, 4H:1V slopes or greater will include the following:

- observing of liner components upslope of the protective cover for indications of excessive strain (longitudinal wrinkles, lifting of geotextile off of the underlying liner components, warping, skewness, etc.);
- observing of the anchor trenches for signs of distress;
- observing the length of each increment of leachate collection layer for compliance with the project technical specifications; and
- recording of all observations deemed to be significant in the CQA Consultant's opinion.

During construction of the protective cover increments, the CQA Consultant will prepare a daily record of all observations of the stability and integrity of the protective cover and underlying liner components. This record will note any signs of distress, and copies will be provided as part of the project documentation for review. Should signs of distress in the liner system on the slopes persist, placement of additional protective cover will cease until the reason for distress is determined and eliminated.

3.5.2 Laboratory and Field Tests

The laboratory and field test methods presented in Tables 3-1 and 3-2 and testing frequencies presented in the project technical specifications will apply.

At locations where the field testing of the subbase or subgrade indicates densities or moisture content not conforming to the requirements of the project technical specifications, the failing area will be reworked. Reworking includes scarifying the area, adjusting the moisture content, and recompacting. Equally acceptable is removal of the non-compliant fill and replacement with new fill material.

Hydraulic conductivity (permeability) evaluations will be conducted on the protective cover (leachate collection) layer and other granular materials.

Criteria to be used for determination of acceptability will be identified in this document or in the project technical specifications.

3.5.3 CQA and CQC Testing Frequency

Construction Quality Assurance testing will be conducted by the CQA Consultant in accordance with the project technical specifications or as directed by the Owner or the Engineer. Documentation and reporting of test results will be in accordance with the requirements identified in Section 9.0 of this CQA/CQC Plan.

Preconstruction testing will be conducted on material samples obtained from the borrow source and/or stockpile. Preconstruction testing will consist of material evaluation tests as described in Subsection 3.3 of this section of the CQA/CQC Plan and of the project technical specifications. Construction Quality Control testing will be conducted on samples taken from the material during the course of the work.

Routine testing frequencies for material evaluations and construction quality evaluation are presented in the project technical specifications. Sampling locations will be selected by the CQA Consultant.

During construction, the frequency of testing may be increased at the discretion of the Owner or the CQA Consultant when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas will be considered when:

- the rollers slip during rolling operation;
- the lift thickness is greater than specified;
- the fill material is at an improper moisture content;
- fewer than the specified number of roller passes are made;
- dirt-clogged rollers are used to compact the material;
- the rollers may not have used optimum ballast;
- the fill materials differ substantially from those specified; or
- the degree of compaction is doubtful.

3.5.4 Perforations in Soil Liner

Perforations that must be filled will include, but not be limited to, the following:

- nuclear density test probe locations;
- drive tube locations; and/or
- thickness checks.

Unless otherwise noted, or as directed by the Owner, all perforations of the subbase by probes or sample tubes will be backfilled with a soil and bentonite mixture or equivalent. The mixture will be compacted in-place with a tamping rod, modified, or standard Proctor rammer, or hand tamper, depending on the size of the perforation.

3.5.5 Deficiencies

If a defect is discovered in the earthwork product, the CQA Consultant will immediately determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA Consultant will determine the extent of the deficient area by additional tests, observations, a review of records, or other means that the CQA Consultant deems appropriate. If the defect is related to adverse site conditions, such as overly wet soils or surface desiccation, the CQA Consultant will define the limits and nature of the defect.

3.5.5.1 Notification

After determining the extent and nature of a defect, the CQA Consultant will notify the Owner and Contractor and schedule appropriate retests when the work deficiency is corrected.

3.5.5.2 Repairs and Retesting

The Contractor will correct the deficiency to the satisfaction of the CQA Consultant. If a project Specification criterion cannot be met, or unusual weather conditions hinder work, then the CQA Consultant will develop and present to the Owner suggested solutions for his approval.

All retests recommended by the CQA Consultant must verify that the defect has been corrected before any additional work is performed by the Contractor in the area of the deficiency. The CQA Consultant will also verify that all installation requirements are met and that all submittals are provided.

SECTION 4.0

POLYETHYLENE GEOMEMBRANES CQA/CQC

4.1 POLYETHYLENE GEOMEMBRANE MANUFACTURING, CONFORMANCE TESTING, AND DELIVERY

4.1.1 Polyethylene Geomembrane Manufacturing

The manufacturing of polyethylene (PE) geomembranes will include the manufacturing of those geomembranes identified as high density polyethylene (HDPE).

4.1.1.1 Raw Material

The raw material will be first quality polyethylene resin containing no more than 2 percent clean recycled polymer by weight, and meeting the following minimum specifications:

- Specific Gravity (ASTM D 792 Method A or ASTM D 1505): ≥ 0.94
- Melt Index (ASTM D 1238 Condition 190/2.16): ≤ 1.0 g/10 min (for HDPE geomembranes); and 0.1 g/10 min. (for all other PE geomembranes)

The geomembrane shall meet the manufacturers' quality control and conformance tests for geomembranes shown in Table 4-1.

Compliance testing will be performed by the Geomembrane Manufacturer to demonstrate that the product meets this specification. At the Owner's discretion and cost, additional testing may be performed by the Geosynthetics CQA Laboratory for purposes of conformance. If the results of the Geomembrane Manufacturer's and the Geosynthetic CQA Laboratory's testing differ, the testing will be repeated by the Geosynthetic CQA Laboratory, and the Geomembrane Manufacturer will be allowed to observe this testing. The results of this latter series of tests will prevail, provided that the applicable test methods have been followed.

TABLE 4-1
MANUFACTURERS QUALITY CONTROL TESTS FOR GEOMEMBRANES

Property	Units	ASTM Standard Method
Thickness		D5994 or D5199 (for smooth)
Nominal[1]	mil	
Lowest Individual Reading	mil	
Sheet Density	g/cm3	D792 or D1505
Carbon Black Content	percent	D1603 or D4218
Carbon Black Dispersion	rating	D5596

TABLE 4- 1
MANUFACTURERS QUALITY CONTROL TESTS FOR GEOMEMBRANES

Property	Units	ASTM Standard Method
Tensile Properties		D638
Strength at Yield	ppi	
Strength at Break	ppi	
Elongation at Yield	percent	
Elongation at Break	percent	
Tear Resistance	lbs	D1004
Puncture Resistance	lbs	D4833
Resin$^{(2)}$		
Density	g/cm3	D1505
Oxidative Induction Time	minutes	D 895 or D5885

Notes: (1) Nominal is defined as plus or minus 10 percent of the stated value.
(2) Certification shall be provided for the above properties at the rate of one test per rail car of resin.

TABLE 4- 2
MANUFACTURERS QUALITY CONTROL CONFORMANCE TESTS FOR GEOMEMBRANES

Property	Units	ASTM Standard Method
Thickness		D5994 or D5199 (for smooth)
Nominal$^{(1)}$	mil	
Lowest Individual Reading	mil	
Sheet Density	g/cm3	D792, or D1505
Carbon Black Content	percent	D1603 or D4218
Carbon Black Dispersion	rating	D5596
Tensile Properties		D638
Stress at Yield	ppi	
Stress at Break	ppi	
Strain at Yield	percent	
Strain at Break	percent	

Notes: (1) Nominal is defined as plus or minus 10 percent of the stated value.

TABLE 4- 3 MINIMUM TESTS FOR GEOMEMBRANE SEAMS	
Category	Test Method
Shear Test$^{(1)(2)}$	ASTM D 4437
	Strain Rate = 2 in/min
	1 inch strips
Peel Test$^{(1)(2)}$	ASTM D 4437
	Strain Rate = 2 in/min
	1 inch strips

Notes: (1) A maximum of one non-FTB (film tear bond) per five specimens tested is acceptable provided that strength requirements are met on that sample.
(2) For double fusion welded seams, both tracks shall be tested to meet compliance with the minimum property values listed above.

Prior to the installation of any polyethylene geomembrane material, the Geomembrane Manufacturer will provide the Project Manager and the CQA Consultant with the following information as a bound document with the individual sections clearly identified:

- the origin (Resin Supplier's name and resin production plant), identification (brand name, number), and production date of the resin;
- a copy of the quality control certificates issued by the Resin Supplier;
- reports on the tests conducted by the Geomembrane Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project (refer to Table 4-1a for tests); and
- a statement that no reclaimed polymer is added to the resin (however, the use of polymer recycled during the manufacturing process may be permitted if done with appropriate cleanliness and if recycled polymer does not exceed 2 percent by weight).

The CQA Consultant will review these documents and report any discrepancies with the above requirements to the Project Manager.

4.1.1.2 Polyethylene Geomembrane Manufacturing

Prior to the installation, the Geomembrane Manufacturer will provide the Project Manager and the CQA Consultant with the following:

- a properties sheet including, at a minimum, all specified properties, measured using test methods indicated in the project technical specifications, or equivalent;
- the sampling procedure and results of testing; and
- a certification that property values given in the properties sheet are minimum vales and are guaranteed by the Geomembrane Manufacturer.

The CQA Consultant will verify that:

- the reported property values certified by the Geomembrane Manufacturer meet all of the project technical specifications; and
- the measurements of properties by the Geomembrane Manufacturer are properly documented and that the test methods used are acceptable.

4.1.1.3 Rolls

Prior to shipment, the Geomembrane Manufacturer will provide the Project Manager and the CQA Consultant with a quality control certificate for each roll of geomembrane provided. The quality control certificate will be signed by a responsible party employed by the Geomembrane Manufacturer, such as the Production Manager. The quality control certificate will include:

- roll numbers and identification; and
- sampling procedures and results of quality control tests -- as a minimum, results will be given for thickness, tensile characteristics (yield and break, strength, and elongation) and tear resistance, evaluated in accordance with the methods indicated in the project technical specifications or equivalent methods approved by the Engineer.

The quality control certificate will be bound and included as part of the report required in Section 4.1.1.1. The CQA Consultant will:

- verify that the quality control certificates have been provided at the specified frequency and that each certificate identified the rolls related to it; and
- review the quality control certificates and verify that the certified roll properties meet the project technical specifications.

4.1.2 Delivery

4.1.2.1 Transportation and Handling

Transportation of the geomembrane is the responsibility of the Geomembrane Manufacturer, Geomembrane Installer, or other party as agreed upon. All handling on site is the responsibility of the Geomembrane Installer.

The CQA Consultant will verify that:

- handling equipment used on the site is adequate and does not pose any risk of damage to the geomembrane; and
- the Geomembrane Installer's personnel handle the geomembranes with care.
- Upon delivery at the site, the Geomembrane Installer and the CQA Consultant will conduct a surface observation of all rolls for defects and damage. This examination will be conducted without unrolling rolls unless defects or damages

are found or suspected. The CQA Consultant will indicate to the Project Manager:

- any rolls, or portions thereof, that should be rejected and removed from the site because they have severe flaws; and
- any rolls that have minor repairable flaws.

Refer to ASTM D4873 for detailed methods.

4.1.2.2 Storage

The Geomembrane Installer will be responsible for the storage of the geomembrane on-site. The Project Manager will provide storage space in a location (or several locations) such that on-site transportation and handling are optimized. The Geomembrane Installer shall ensure that the storage space is adequate to protect the geomembrane from theft, vandalism, vehicular damage, etc.

The CQA Consultant will document that the Geomembrane Installer's storage method of the geomembrane provides adequate protection against dirt, shock, and other sources of damage.

4.2 POLYETHYLENE GEOMEMBRANE INSTALLATION

4.2.1 Earthwork

4.2.1.1 Surface Preparation

The Contractor will be responsible for preparing the supporting soil according to the project technical specifications.

The CQA Consultant and Contractor will document that:

- a Licensed Land Surveyor has verified all lines and grades; and
- the requirements of Section 3.0 (i.e., Soils CQA and CQC) are satisfied.

The Geomembrane Installer will certify in writing that the surface on which geomembrane will be installed is acceptable. The certificate of acceptance will be given by the Geomembrane Installer to the Project Manager prior to commencement of geomembrane installation in the area under consideration. The CQA Consultant will be given a copy of this certificate by the Project Manger.

To ensure a timely covering of the soil liner surface, the Project Manager may allow subgrade acceptance in areas as small as one acre. After the supporting soil has been accepted by the Geomembrane Installer, it will be the Geomembrane Installer's responsibility to indicate to the Project Manager of any change in the supporting soil condition that may require repair work. If the CQA Consultant concurs with the Geomembrane Installer, then the Project Manager will ensure that the supporting soil is repaired.

4.2.1.2 Anchorage System

Anchor trenches will be excavated by the Contractor (unless otherwise specified) to the lines and widths shown on the design drawings, prior to geomembrane placement.

The CQA Consultant and Contractor's CQC Agency will verify that anchor trenches have been constructed according to design drawings.

Slightly rounded corners will be provided in trenches where the geomembrane adjoins the trench so as to avoid sharp bends in the geomembrane. No loose soil will be allowed to underlie the geomembrane in the trenches.

Backfilling of anchor trenches will be conducted in accordance with Section 4.2.5 of this chapter of the CQA/CQC Plan.

4.2.2 Geomembrane Placement

4.2.2.1 Field Panel Identification

The CQA Consultant will document that the Geomembrane Installer labels each field panel with an "identification code" (number or letter-number consistent with the layout plan.

This identification code will be agreed upon by the Project Manager, Geomembrane Installer, and CQA Consultant. It will be the responsibility of the Geomembrane Installer to ensure that each field panel placed is also marked with the original roll number. The roll number will be marked by the Installer at a location agreed upon by the Project Manager, Geomembrane Installer, and CQA Consultant.

The Geomembrane Installer will establish a table or chart showing correspondence between roll numbers and field panel identification codes. This documentation shall be submitted to the CQA Agency weekly for review and verification.

The field panel identification code will be used for all quality control and quality assurance records.

4.2.2.2 Field Panel Placement

4.2.2.2.1 Location

The CQA Consultant will verify that field panels are installed at the location indicated in the Geomembrane Installer's layout plan, as approved or modified by the Engineer. The Geomembrane Installer shall maintain a weekly updated as-built drawing showing the location of all field panels.

4.2.2.2.2 Installation Schedule

Field panels will be placed one at a time, and each field panel will be seamed immediately after its placement (in order to minimize the number of unseamed field panels exposed to wind.)

It is usually beneficial to "shingle" overlaps in the downward direction to facilitate drainage in the event of precipitation. It is also beneficial to proceed in the direction of prevailing winds. Scheduling decisions must be made during installation, in accordance with varying conditions. In any event, the Geomembrane Installer will be fully responsible for the decision made regarding placement procedures.

The CQA Consultant will evaluate every change in the schedule proposed by the Geomembrane Installer and advise the Project Manger on the acceptability of that change. The Geomembrane Installer and CQA Consultant will verify that the condition of the supporting soil has not changed detrimentally during installation.

The CQA Consultant will record the identification code, location, and date of installation of each field panel.

4.2.2.2.3 Weather Condition

Geomembrane placement will not proceed at an ambient temperature below 40°F (5°C) or above 104°F (40°C) unless otherwise authorized.

Geomembrane placement will not be done during any precipitation, in an area of ponded water, or in the presence of excessive winds (more than 20 miles per hour).

The Contractor and Geomembrane Installer shall be responsible for protecting the liner from storm water, wind, extreme temperature, and other environmental conditions.

The CQA Consultant will verify that the above conditions are fulfilled. Additionally, the CQA Consultant and Geomembrane Installer will verify that the supporting soil has not been damaged by weather conditions.

The CQA Consultant will inform the Project Manager if the above conditions are not fulfilled.

4.2.2.2.4 Method of Placement

The following is the responsibility of the Geomembrane Installer; the CQA Consultant will document that these conditions are satisfied:

- any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons, or other means;
- the prepared surface underlying the geomembrane has not deteriorated since previous acceptance, and is still acceptable immediately prior to geomembrane placement;
- any geosynthetic elements immediately underlying the geomembrane are clean and free of debris;
- all personnel working on the geomembrane do not smoke, wear damaging shoes, or engage in other activities that could damage the geomembrane;
- the method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil;

- the method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);
- adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind (in case of high winds, continuous loading, e.g., by adjacent sand bags, is recommended along the edges of panels to minimize the risk of wind flow under the panels); and
- direct contact with the geomembrane is minimized, i.e., the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials, in areas where excessive traffic may be expected.

The CQA Consultant will inform the Project Manager if the above conditions are not fulfilled.

4.2.2.2.5 Damage

The CQA Consultant and Geomembrane Installer will visually observe each panel, after placement and prior to seaming, for damage. The CQA Consultant will advise the Project Manager which panels, or portion of panels, should be rejected, repaired, or accepted.

Damaged panels or portions of damaged panels which have been rejected will be marked and their removal from the work area recorded by the CQA Consultant. Repairs will be made according to procedures described in Section 4.2.4.

As a minimum, the CQA Consultant will document that:

- the panel is placed in such a manner that it is unlikely to be damaged; and
- any tears, punctures, holes, thin spots, etc., are either marked by the Geomembrane Installer for repair or the panel is rejected.

4.2.3 Field Seaming

4.2.3.1 Seam Layout

The Geomembrane Installer will provide the Project Manager and the CQA Consultant with a seam layout drawing, i.e., a drawing of the facility to be lined showing all expected seams. The CQA Consultant will review the seam layout drawing and verify that it is consistent with the accepted state of practice and this CQA/CQC Plan. In addition, no panels not specifically shown on the seam layout drawing may be used without the Project Manger's prior approval.

In general, seams should be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than 10 feet from the toe of slopes, or areas of potential stress concentrations, unless otherwise authorized by the CQA Consultant or Engineer.

A seam numbering system compatible with the panel numbering system will be agreed upon at the Resolution and/or Preconstruction Meeting. An on-going written record of the seams and repair areas shall be maintained by the Geomembrane Installer with weekly review by the CQA Consultant.

4.2.3.2 Requirements of Personnel

All personnel performing seaming operations will be qualified by experience and by successfully passing seaming tests. Seaming personnel must have seamed at least 1,000,000 square feet of polyethylene geomembrane seams using the same type of seaming apparatus to be used on this project.

At least one seamer will have experience seaming a minimum of 5,000,000 square feet of polyethylene geomembrane seams using the same type of seaming apparatus to be used on this site-specific geomembrane. The most experienced seamer, the "master seamer," will provide direct supervision over less experienced seamers.

The Geomembrane Installer will provide the Project Manager and the CQA Consultant with a list of proposed seaming personnel and their experience records. This document will be reviewed by the Project Manger and the CQA Consultant.

4.2.3.3 Seaming Equipment and Products

Approved processes for field seaming are extrusion seaming and fusion seaming. Proposed alternate processes will be documented and submitted to the Owner or his representative for his approval. Only apparatus which have been specifically approved by make and model will be used. The Project Manager will submit all documentation to the CQA Consultant for his concurrence.

4.2.3.3.1 Extrusion Process

The extrusion seaming apparatus will be equipped with gauges giving the relevant temperatures of the apparatus such as the temperatures of the extrudate, nozzle, and preheat.

The Geomembrane Installer will provide documentation regarding the extrudate to the Project Manger and the CQA Consultant, and will certify that the extrudate is compatible with the project technical specifications, and, in any event, is comprised of the same resin as the geomembrane sheeting.

The CQA Consultant will log apparatus temperatures, extrudate temperatures, and ambient temperatures at appropriate intervals. Ambient temperatures will be measured 6 in. above the geomembrane surface.

The CQA Consultant and Geomembrane Installer will verify that:

- equipment used for seaming is not likely to damage the geomembrane;

- the extruder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;
- clean and dry welding rods or extrudate pellets are used;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- grinding is performed within one hour prior to seaming;
- a smooth insulating plate or fabric is placed beneath the hot seaming apparatus after usage;
- the geomembrane is protected from damage in heavily trafficked areas;
- grinding is done in accordance with the Geomembrane Installer's CQC program; and
- no seam areas contain "overgrind."

4.2.3.3.2 Fusion Process

The fusion seaming apparatus must be automated vehicular-mounted devices. The fusion seaming apparatus will be equipped with gauges giving the applicable temperatures. Pressure settings will be verified by the Geomembrane Installer prior to each seaming period.

The Geomembrane Installer will log ambient, seaming apparatus, and geomembrane surface temperatures.

The CQA Consultant and Geomembrane Installer will also verify that:

- equipment used for seaming is not likely to damage the geomembrane;
- for cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to seaming;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- a smooth insulating plate or fabric is placed beneath the hot seaming apparatus after usage;
- the geomembrane is protected from damage in heavily trafficked areas; and
- build-up of moisture between the sheets is prevented (a movable protective layer may be used as required directly below each overlap of geomembrane that is to be seamed to accomplish this end).

4.2.3.4 Seam Preparation

The CQA Consultant and Geomembrane Installer will verify that:

- prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material;

- if seam overlap grinding is required, the process is completed according to the Geomembrane Manufacturer's instructions within one hour of the seaming operation, and in a way that does not damage the geomembrane;
- the abrading does not show on either side of the extrusion seam; and
- seams are aligned with the fewest possible number of wrinkles and "fishmouths."

4.2.3.5 Seaming Weather Conditions

The normally required weather conditions for seaming are as follows:

- unless authorized in writing by the Project Manager, no seaming will be attempted at an ambient temperature below 40°F (5°C) or above 104°F (40°C); and
- the geomembrane will be dry and protected from wind more than 20 miles per hour.

If the Geomembrane Installer wishes to use methods which may allow seaming at ambient temperatures below 40°F (5°C) or above 104°F (40°C), the Geomembrane Installer will demonstrate and certify that such methods produce seams which are entirely equivalent to seams produced at ambient temperatures above 40°F (5°C) and below 104°F (40°C), and that the overall quality of the geomembrane is not adversely affected. In addition, an addendum to the contact between the Owner and the Geomembrane Installer is required which specifically states that the seaming procedure does not cause any physical or chemical modification to the geomembrane that will generate any short or long-term damage to the geomembrane. Then, the temperatures in the above quality assurance procedure will be modified accordingly. Ambient temperatures will be measured 6 inches above the geomembrane surface.

The CQA Consultant will verify that these weather conditions are fulfilled and will advise the Project Manager if they are not. The Project Manager will then decide if the installation will be stopped or postponed.

4.2.3.6 Overlapping and Temporary Bonding

The Geomembrane Installer will ensure that, and the CQA Consultant will verify that:

- the panels of geomembrane have a finished overlap of a minimum of 3 inches for extrusion seaming and 5 inches for fusion seaming, but in any event sufficient overlap will be provided to allow peel tests to be performed on the seam;
- no solvent or adhesive is used; and
- the procedure used to temporarily bond adjacent panels together does not damage the geomembrane (in particular, the temperature of hot air at the

nozzle of any spot seaming apparatus is controlled such that the geomembrane is not damaged).

The CQA Consultant will log all appropriate temperatures and conditions, and will log and report to the Project Manager any noncompliance.

4.2.3.7 Trial Seams

Trial seams will be made on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. Such trial seams will be made at the beginning of each seaming period (shift), and at least once every five hours, for each seaming apparatus used in the seaming period. Also, each seamer will make at least one trial seam each seaming period. Trial seams will be made under the same conditions at actual seams. If any seaming apparatus is turned off for any reasons, a new passing trial seam must be completed for that specific seaming apparatus. The Geomembrane Installer shall provide the tensiometer required for seam and peel testing in the field. The tensiometer shall be automatic and shall have a direct digital readout.

The trail seam sample will be at least 3 feet long by 1 foot wide (after seaming) with the seam centered lengthwise. Seam overlap will be as indicated in Section 4.2.3.6.

Two specimens, each 1 inch wide, will be cut from the trial seam sample by the Geomembrane Installer. Two specimens will be tested in shear and peel using a field tensiometer, and they should not fail in the seam, as described in Section 4.2.3.10.5. If a specimen fails, the entire operation should be repeated. If the additional specimen fails, the seaming apparatus and seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful full trial seams are achieved. The CQA Consultant will observe all trial seam procedures. At the request of the Project Manger and CQA Consultant, the remainder of the successful trial seam sample will be assigned a number and marked accordingly by the Geomembrane Installer, who will also log the date, hour, ambient temperature, number of seaming unit, name of seamer, and pass or fail description.

The sample itself will be cut into three pieces, one to be retained in the Owner's archives, one to be given to the Geomembrane Installers, and one to be tested by the Geosynthetics CQA Laboratory.

After completion of the above described tests, the remaining portion of the trial seam sample can be discarded. Alternatively, if agreed upon between the parties involved and documented by the CQA Consultant in his daily report, the remaining portion of the trial seam sample can be subjected to destructive testing. If a trial seam sample fails a test conducted by the Geosynthetics CQA Laboratory, then a destructive test seam sample will be taken from each of the seams completed by the seamer during the shift related to the considered trial seam. These samples will be forwarded to the Geosynthetics CQA Laboratory and, if they fail the tests, the procedure indicated in Subsection 4.2.3.10.8 of this Section of the CQA/CQC Plan will apply. The conditions of this paragraph will be considered as met for a given seam if a destructive seam test sample has already been taken.

4.2.3.8 General Seaming Procedure

Unless otherwise specified, the general seaming procedure used by the Geomembrane Installer will be as follows.

- For fusion seaming, a movable protective layer of plastic may be required to be placed directly below each overlap of geomembrane that is to be seamed. This is to help prevent any moisture buildup between the sheets to be seamed.
- If required, a firm substrate will be provided by using a flat board or similar hard surface directly under the seam overlap to achieve proper support.
- Fishmouths or wrinkles at the seam overlaps will be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles will be seamed and any portion where the overlap is inadequate will then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

If approved by the Project Manager, seaming operations can be carried out at night only with adequate illumination.

Seaming will extend to the outside edge of panels to be placed in the anchor trench.

The CQA Consultant will verify that the above seaming procedures are followed, and will inform the Project Manager if they are not.

4.2.3.9 Nondestructive Seam Continuity Testing

The Geomembrane Installer will nondestructively test all field seams over their full length using a vacuum test unit, air pressure test (for double fusion seams only), or other approved method. The testing will be carried out to the accepted standards of the industry. The purpose of nondestructive tests is to check the continuity of seams. It does not provide any information on seam strength. Continuity testing will be carried out as the seaming work progresses, not at the completion of all field seaming. Nondestructive testing will be not permitted before sunrise or after sunset unless the Geomembrane Installer demonstrates capabilities to do so.

The Geomembrane Installer shall record the results of all seam continuity testing and provide daily submittal of test results to the CQA Consultant. The CQA Consultant shall provide a CQA Monitor(s) to observe the nondestructive testing to ensure conformance with this CQA/CQC Plan.

4.2.3.9.1 Air Pressure Testing

Inflate the test channel to a pressure between 25 to 30 psi, in accordance with the following schedule, close valve, and observe initial pressure after approximately two minutes.

TABLE 4- 4
INITIAL PRESSURE SCHEDULE(1)

Material (mil)	Minimum psi	Maximum psi
40	25	30
60	27	30
80	30	30
100	30	30

Notes: (1) Initial pressure settings are read after a two-minute "relaxing period." The purpose of this "relaxing period" is to permit the air temperature and pressure to stabilize.

Observe and record the air pressure five minutes after "relaxing period" ends and initial pressure setting is used. If loss of pressure exceeds the following or if the pressure does not stabilize, locate the faulty area and repair.

TABLE 4- 5
MAXIMUM PERMISSIBLE PRESSURE DIFFERENTIAL
AFTER FIVE MINUTES - HDPE

Material (Mil)	Pressure Differential
40	4 psi
60	3 psi
80	3 psi
100	3 psi

At the conclusion of the pressure test, the end of the seam opposite the pressure gauge is cut. A decrease in gauge pressure must be observed or the air channel will be considered "blocked" and the test will have to be repeated after the blockage is corrected.

Remove needle or other approved pressure feed device and seal the resulting hole by extrusion welding.

Test results will be recorded by the Geomembrane Installer and verified by the CQA Consultant on a daily basis.

4.2.3.9.2 Noncomplying Air Pressure Test

In the event of a noncomplying air pressure test, the following procedure shall be follows.

- Check the seam end seals and retest the seams.

- If noncompliance with specified maximum pressure differential occurs, cut one-inch samples from each end of the seam.
- Perform destructive peel tests on the samples using the field tensiometer.
- If all samples pass destructive testing, remove the overlap left by the wedge welder and vacuum test the entire length of the seam.
- If a leak is located by the vacuum test, repair by extrusion welding. Test the repair by vacuum testing.
- If one or more samples fail the peel tests, additional samples will be taken. When two passing samples are located, the seam outside of theses two locations will be considered noncomplying. The noncomplying areas will be repaired by extrusion welding. Test the entire length of the seam by vacuum testing.

4.2.3.9.3 Vacuum Testing

- Trim excess overlap from the seam, if any.
- Turn on the vacuum pump to reduce the vacuum box to approximately 5 inches of mercury, i.e., 5 psi gauge.
- Apply a generous amount of a solution of strong liquid detergent and water to the area to be tested.
- Place the vacuum box over the area to be tested and apply sufficient downward pressure to "seat" the seal strip against the liner.
- Close the bleed valve and open the vacuum valve.
- Apply a minimum of five inches of mercury vacuum to the area as indicated by the gauge on the vacuum box.
- Ensure that a leak tight seal is created.
- For a period of not less than 20 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
- If no bubbles appear after 20 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum three-inch overlap, and repeat the process.

4.2.3.9.4 Procedure for Noncomplying Tests

- Mark all areas where soap bubbles appear and repair the marked areas.
- Retest repaired areas.

The CQA Consultant will:

- observe continuity testing performed by the Geomembrane Installer;
- record location, date, test unit number, name of tester, and compile the record of testing provided by the Geomembrane Installer;
- provide a walkthrough inspection of all seam areas and verify that the areas have been tested in accordance with the CQA/CQC Plan; and

- verify that the Geomembrane Installer has marked repair areas with a color-coded marking pencil.

The Geomembrane Installer will complete any required repairs in accordance with Subsection 4.2.4.

The Geomembrane Installer shall mark the location and size of all seam repairs on the as-built drawings.

The CQA Consultant will:

- observe the repair and retesting of the repair areas;
- mark on the geomembrane that the repair has been made; and
- document the results.

The Geomembrane Installer will use the following procedures at locations where seams cannot be nondestructively tested:

All such seams will be cap-stripped with the same geomembrane.

If the seam is accessible to testing equipment prior to final installation, the seam will be nondestructively tested prior to final installation.

If the seam cannot be tested prior to final installation, the seaming and cap-stripping operations will be observed by the CQA Consultant and Geomembrane Installer for uniformity and completeness and documented.

The seam number, date of observation, name of tester, and outcome of the test or observation will be recorded by the CQA Consultant and Geomembrane Installer.

4.2.3.10 Destructive Testing

4.2.3.10.1 Concept

Destructive seam tests will be performed at selected locations. The purpose of these tests is to evaluate seam strength. Seam strength testing will be done as the seaming work progresses, not at the completion of all field seaming.

4.2.3.10.2 Location and Frequency

The CQA Consultant will select locations where seam samples will be cut out for laboratory testing. Those locations will be established as follows.

- A minimum frequency of one test location per 500 feet of seam length. This minimum frequency is to be determined as an average taken throughout the entire facility.
- A maximum frequency will be agreed upon by the Geomembrane Installer, Project Manager, and CQA Manager at the Resolution and/or Preconstruction Meeting.

Test locations will be determined during seaming at the CQA Consultant's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, off-center and/or offset seams, or any other potential cause of imperfect seaming. If the CQA Consultant deems than an area is of concern, a sample may be taken at random.

The Geomembrane Installer will not be informed in advance of the locations where the seam samples will be taken.

4.2.3.10.3 Sampling Procedure

Samples will be cut by the Geomembrane Installer as the seaming progresses in order to have laboratory test results before the geomembrane is covered by another material. The CQA Consultant will:

- observe sample cutting;
- assign a number to each sample, and mark it accordingly;
- record the sample location on the layout drawing; and
- record the reason for taking the sample at this location (e.g., statistical routine, suspicious feature of the geomembrane).

All holes in the geomembrane resulting from destructive seam sampling will be immediately repaired in accordance with repair procedures described in Subsection 4.2.4.3 of this Section of the CQA/CQC Plan. The continuity of the new seams in the repaired area will be tested according to Subsection 4.2.3.9.

4.2.3.10.4 Size of Samples

The sample shall be sufficiently sized so that ten 1-inch wide by 6-inch long coupons can be cut for each field, laboratory or archive sample. The number of samples required for distribution to the owner and laboratory(s) will determine the actual field (cutout) sample size. Final determination will be made at the preconstruction meeting.

4.2.3.10.5 Field Testing

Ten 1-inch wide specimens mentioned in Subsection 4.2.3.10.4 will be tested in the field, by tensiometer. Five specimens will be tested for peel and five specimens will be tested for shear. Each specimen should not fail in the seam. If any field test sample fails to pass, then the procedures outlined in Subsection 4.2.3.10.8 will be followed.

The CQA Consultant will witness field tests and mark all samples and portions with their number. The CQA Consultant and Geomembrane Installer will also log the date and time, ambient temperature, number of seaming unit, name of technician, seaming apparatus temperatures, pressures and speeds, pass or fail description, and attach a copy to each sample portion.

4.2.3.10.6 Geosynthetics CQA Laboratory Testing

Destructive test samples will be packaged and shipped, if necessary, under the responsibility of the CQA Consultant in a manner that will not damage the test sample. The Project Manager will be responsible for storing the archive samples. This procedure will be fully outlined at the Resolution Meeting. Test samples will be tested by the Geosynthetics CQA Laboratory. The Geosynthetics CQA Laboratory will be selected by the Project Manager.

Testing will include "Seam Strength" and "Peel Adhesion" (ASTM D 638 using 1-inch strips and a strain rate of two inches per minute). At least five specimens will be tested for each test method. Specimens shall be selected alternately by test from the samples (i.e., peel, shear, peel, and shear). All seam tests shall exhibit a Film Tearing Bond (FTB) type of separation.

All geomembrane destructive test samples that manifest non-FTB failures shall be saved and sent to the CQA Consultant for observation.

The Geosynthetics CQA Laboratory will provide preliminary test results no more than 24 hours after they receive the samples. The CQA Consultant will review laboratory test results as soon as they become available, and make appropriate recommendations to the Project Manager.

Should field tensiometer testing be carried out, the following procedure should be followed:

- if the test passes, the sample qualifies for testing in the laboratory; and
- if it fails, the seam should be repaired in accordance with Subsection 4.2.3.10.8.

4.2.3.10.7 Installer's Laboratory Testing

The Geomembrane Installer's laboratory testing is optional. The Geomembrane Installer's laboratory test results, if performed, will be presented to the Project Manager and the CQA Consultant for review. Conflicting test results will be resolved by the CQA Consultant.

4.2.3.10.8 Procedures for Destructive Test Failure

The following procedures will apply whenever a sample fails a destructive test, whether that test is conducted by the Geosynthetics CQA Laboratory, the Geomembrane Installer's laboratory, or by field tensiometer. The Geomembrane Installer has two options.

- The Geomembrane Installer can reconstruct the seam between any two passed destructive seam test locations.
- The Geomembrane Installer can trace the seaming path to an intermediate location (at 10-foot minimum from the point of the failed test in each direction) and take a small sample for an additional field test at each location. If these additional samples pass tensiometer testing, then full destructive laboratory samples are taken. If these destructive laboratory samples pass the tests, then

the seam is capped between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be capped.

If a fusion type seam fails destructive testing and the Geomembrane Installer chooses to repair the seam, the only acceptable method is as described in Subsection 4.2.4.3.

All acceptable seams must be bounded by two locations from which destructive samples passing laboratory tests have been taken.

The CQA Consultant will document all actions taken in conjunction with destructive test failures.

4.2.4 Defects and Repairs

4.2.4.1 Identification

All seams and non-seam areas of the geomembrane will be examined by the CQA Consultant for identification of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane will be clean at the time of examination. The geomembrane surface will be broomed or washed by the Geomembrane Installer if the amount of dust or mud inhibits examination.

4.2.4.2 Evaluation

Each suspected location, both in seam and non-seam areas, will be nondestructively tested using the methods described in Subsection 4.2.3.9 as appropriate. Each location which fails the nondestructive testing will be marked by the CQA Consultant and repaired by the Geomembrane Installer. Work will not proceed with any materials which will cover locations which have been repaired until laboratory test results with passing values are available.

4.2.4.3 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, will be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure will be agreed upon between the Project Manager, Geomembrane Installer, and CQA Manager. The procedures available include:

- patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter;
- grinding and reseaming, used to repair small sections of extruded seams;
- spot seaming, used to repair small tears, pinholes, or other minor, localized flaws;
- capping, used to repair large lengths of failed seams;
- topping, used to repair areas of inadequate seams, which have an exposed edge; and

- removing bad seams and replacing with a strip of new material welded into place.

In addition, the following provisions will be satisfied:

- surfaces of the geomembrane which are to be repaired will be abraded no more than one hour prior to the repair;
- all surfaces must be clean and dry at the time of the repair;
- all seaming equipment used in repairing procedures must be approved;
- the repair procedures, materials, and techniques will be approved in advance of the specific repair by the CQA Consultant and Geomembrane Installer; and
- patches or caps will extend at least 6 inches beyond the edge of the defect, and all corners of patches will be rounded with a radius of at least 3 inches.

4.2.4.4 Verification of Repairs

Repairs larger than 2 feet in length (or diameter) will be numbered and logged. All repairs will be nondestructively tested using the methods described in Subsection 4.2.3.9 as appropriate. Repairs which pass the nondestructive test will be taken as an indication of an adequate repair and welding of repair patches will not be counted in the destructive seam testing frequency. Large caps may be of sufficient extent to require destructive testing, at the discretion of the CQA Consultant. Failed tests will require the repair to be redone and retested until a passing test results.

The CQA Consultant should observe all nondestructive testing of repairs and will record the date of the repair and test outcome.

The Geomembrane Installer shall record the location of all repairs on the as-built drawings. The repair record shall include the size and type of repair procedure.

4.2.4.5 Large Wrinkles

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed), and prior to placing overlying materials, the CQA Consultant will observe the geomembrane wrinkles. Wrinkles with a height to width ratio greater than 1.0 should be cut and reseamed by the Geomembrane Installer. The CQA Consultant will indicate to the Geomembrane Inspector which wrinkles should be cut and reseamed. This seam thus produced will be tested like any other seam.

4.2.5 Backfilling of Anchor Trench

Anchor trenches will be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open. Anchor trenches will be backfilled and compacted by the Contractor or the Geomembrane Installer, as outlined in the project technical specifications or Bid Documents.

Care will be taken when backfilling the trenches to prevent any damage to the geosynthetics.

The CQA Consultant will observe the backfilling operation and advise the Project Manager of any problems.

4.2.6 Liner System Acceptance

The Geomembrane Installer and the Geosynthetic Manufacturers will retain all ownership and responsibility for the geosynthetics in the landfill cell until acceptance by the Owner.

The geomembrane component of the liner system will be accepted by the Owner when:

- the installation is finished;
- verification of the adequacy of all seams and repairs, including associated testing, is complete;
- Geomembrane Installer provides the CQA Consultant and Project Manager with a final copy of the nondestructive test documentation, repair information, and as-built drawings;
- CQA Consultant furnishes the Project Manager with certification that the geomembrane was installed in accordance with the Geosynthetic Manufacturer's recommendations as well as the Plans and project technical specifications;
- all documentation of installation is completed including the CQA Consultant's and Geomembrane Installer’s final report; and
- certification, including Record Drawing(s), sealed by a Professional Engineer registered in the state in which the project is located, has been received by the Project Manger.

The CQA Consultant will certify that installation has proceeded in accordance with this CQA/CQC Plan for the project except as noted to the Project Manager.

4.2.7 Materials in Contact with the PE Geomembranes

The quality assurance procedures indicated in this subsection are only intended to assure that the installation of these materials does not damage the geomembrane.

Although protective geosynthetics and geotextiles have been incorporated into the liner system, all reasonable measures to protect the geomembrane and provide additional quality assurance are necessary to assure that systems built with these materials will be constructed to ensure proper performance.

4.2.7.1 Soils

Prior to placement, the CQA Consultant will test and visually confirm that all soil materials to be placed against the geomembrane comply with the testing requirements as presented in the project technical specifications. The Geomembrane Installer will provide a written surface acceptance certificate in accordance with Section 4.2.1. All soil materials shall be placed and compacted using low ground pressure rubber-tired or low ground pressure tracked equipment and a smooth drum roller. Care shall be taken not to displace the geomembrane or overlying protective geosynthetics and geotextiles. The subbase (or subgrade) and soil liner surface shall be graded smoothly to prevent puncture of the geomembrane. The initial placement and compaction of the soil component of the liner system shall be conducted in as thick a lift as practical to achieve the desired permeability and density. Also, the protective cover and collection piping shall be placed in such a manner as to prevent damage to the geomembrane or geosynthetic liner material.

4.2.7.2 Manhole and Appurtenance Structures

During the installation of the manhole and other appurtenances, as applicable, care shall be exercised so as not to damage the geomembrane.

As a precautionary measure, additional polyethylene sheet stock and a base of sand shall be prepared prior to installing potentially abrasive appurtenances. At no time shall manholes or abrasive items be in direct contact with the geomembrane. Manholes shall be lowered into place using a small crane or lift truck, with lifting hooks and a secondary security cable or chain to prevent an inadvertent lowering of the manhole.

4.2.7.3 Appurtenances

A copy of the project technical specifications prepared by the Engineer for appurtenances will be given by the Project Manager to the CQA Consultant for review.

The CQA Consultant will verify that:

- installation of the geomembrane in appurtenance areas, and connection of geomembrane to appurtenances have been made according to the project technical specifications;
- extreme care is taken while seaming around appurtenances since neither nondestructive nor destructive testing may be feasible in these areas;
- the geomembrane has not been visibly damaged while making connections to appurtenances; and
- the CQA Consultant will inform the Project Manager if the above conditions are not fulfilled.

SECTION 5.0

GEOTEXTILE MATERIAL AND INSTALLATION CQA

5.1 MANUFACTURING

The Geotextile Manufacturer will provide the Project Manager with a list of guaranteed "minimum average roll value" properties (as defined in the specifications), for the type of geotextile to be delivered. The Geotextile Manufacturer will also provide the Project Manager with a written certification signed by a responsible party that the materials actually delivered have "minimum average roll value" properties which meet or exceed all property values guaranteed for that type of geotextile.

The CQA Consultant will examine all manufacturer certifications to ensure that the property values listed on the certifications meet or exceed those specified for the particular type of geotextile. Any deviations will be reported to the Project Manager.

The inspection methods, handling techniques, and property values identified in this section for the 8 oz/sy geotextile shall also apply to geotextile portion of the drainage composite which will be heat bonded to the drainage net (see Section 7.0 for more detail).

5.2 LABELING

The Geotextile Manufacturer will identify all rolls of geotextile with the following:

- manufacturer's name;
- product identification;
- lot number;
- roll number;
- roll weight; and
- roll dimensions.

Additionally, if any special handling of the geotextile is required, it will be so marked on the top surface of the geotextile, e.g., "This Side Up."

The CQA Consultant will examine rolls upon delivery and any deviation from the above requirements will be reported to the Project Manager.

5.3 SHIPMENT AND STORAGE

During shipment and storage, the geotextile will be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting, or any other damaging or deleterious conditions.

Geotextiles will not be exposed to precipitation prior to being installed. Wrappings protecting geotextile rolls will be removed less than one hour prior to unrolling the geotextile. After the wrapping has been removed, a geotextile will not be exposed to sunlight for more than 15 days, unless otherwise specified and guaranteed by the Geotextile Manufacturer.

The CQA Consultant will observe rolls upon delivery at the site and any deviation from the above requirements will be reported to the Project Manager. Any damaged rolls will be rejected and replaced at no cost to the Owner.

5.4 HANDLING AND PLACEMENT

The Geomembrane Installer will handle all geotextiles in such a manner as to ensure they are not damaged in any way, and will comply with the following:

- in the presence of wind, all geotextiles will be weighted with sandbags or the equivalent. Sandbags will be installed during placement and will remain until replaced with protective cover soils or subsequent geosynthetic layers;
- geotextiles will be cut using an approved geotextile cutter only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles;
- the Geomembrane Installer will take any necessary precautions to prevent damage to the underlying layers during placement of the geotextile;
- during placement of geotextiles, care will be taken not to entrap in the geotextiles stones or excessive dust that could damage the geomembrane or geotextile, generate clogging of drains or filters, or hamper subsequent seaming;
- a visual examination of the geotextile will be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, such as needles, are present; and
- if white or gray colored geotextile is used, precautions will be taken against "snowblindness" of personnel.

5.5 SEAMS AND OVERLAPS

All geotextiles will be continuously sewn unless otherwise approved by the CQA Consultant and Engineer. No horizontal seams will be allowed on sideslopes steeper than 20 percent (i.e., seams will be along, not across, slopes steeper than 5H:1V), except as part of a patch, or as approved by the CQA Consultant and Engineer.

The Geomembrane Installer will pay particular attention at seams to ensure that no protective cover material could be inadvertently inserted beneath the geotextile.

Sewing will be done using polymeric thread with chemical resistance properties equal to or exceeding those of the geotextile.

5.6 REPAIR

Any holes or tears in the geotextile will be repaired as follows.

- On slopes steeper than 20 percent: A patch made from the same geotextile will be seamed into place no closer than 1-inch from any edge.
- On slopes less than or equal to 20 percent: A patch made from the same geotextile will be spot-seamed in place with a minimum of 24 inches overlap in all directions.

Care will be taken to remove any soil or other material which may have penetrated the torn geotextile.

The CQA Consultant will observe any repair, note any noncompliance with the above requirements and report them to the Project Manager.

5.7 PLACEMENT AND MATERIALS

All soil materials located on top of a geotextile shall be placed in such a manner as to ensure:

- no damage to the geotextile and underlying geosynthetics;
- minimal slippage of the geotextile on underlying layers;
- no excess tensile stresses in the geotextile;
- equipment used for placing the protective cover material will not be driven directly on the geotextile;
- a minimum thickness of 1 foot of soil is specified between a light dozer (such as a wide pad Caterpillar D-3) and the geotextile;
- a minimum thickness of 1.5 foot of soil is specified between rubber-tired vehicles and the geotextile; and
- in heavily trafficked areas such as access ramps, soil thickness should be at least 3 feet.

Any noncompliance will be noted by the CQA Consultant and reported to the Project Manager.

Placement of the leachate collection layer and buffer layer will be sequenced to prevent distress of the geotextile. The CQA Consultant will observe placement of materials on the sideslopes.

Monitoring of the material placement on slopes greater than 3H:1V will include the following:

- observing the length of each increment for compliance with the specified lengths;
- observing of liner components (specifically geotextile filter) upslope of the protective cover for indications of excessive strain (longitudinal wrinkles, lifting of geotextile off of the underlying liner components, warping, skewness, etc.);
- observing of the anchor trenches for signs of distress; and
- recording of all observations.

TABLE 5- 1
MANUFACTURER QUALITY CONTROL CONFORMANCE TESTS FOR NON-WOVEN GEOTEXTILES

Property	Units
Unit Weight, ASTM D 5261	oz/yd2
Grab Tensile, ASTM D 4632	lbs
Grab Elongation, ASTM D 4632	percent
Puncture Strength, ASTM D 4833	lbs
Trapezoidal Tear, ASTM D 4533	lbs
Apparent Opening Size, ASTM D 4751(1)	sieve size
Permitivity, ASTM D 4491(a)	sec-1

Notes: (1) Test run only on material which is to be used in filter applications.

SECTION 6.0
HDPE MANHOLES, PIPE AND FITTINGS CQA

6.1 MATERIAL REQUIREMENTS

6.1.1 General

All materials described below shall be produced in accordance with the requirements listed below and the project technical specifications.

6.1.2 Manholes

High density polyethylene (HDPE) manholes shall be produced conforming to the requirements of Type III, Grade P34, as described in ASTM D 1248.

6.1.3 Pipe

HDPE piping must conform to the requirements of ASTM Designation D 2387, Class PE3408. All pipe should comply with the following standards:

- ASTM F714 - pipe S.T.D.;
- ASTM D 1248, Type III, Class C, Category 5; Grade P34; and
- PPI PE3408.

6.1.4 Fittings

HDPE pipe fittings will be furnished by the manufacturer of the pipe with which they are used and conform to the requirements of ASTM Designation D 3261 for standard fittings. All pipe must be in compliance with the standards listed in 6.1.3 above.

6.1.5 Joints

All pipe joints will be fusion welded, using only manufacturer approved methods and equipment. Joints inside of manholes will be joined with mechanical transition couplings.

6.2 MANUFACTURER

Prior to the installation of HDPE pipe, the HDPE Pipe Manufacturer will provide to the CQA Consultant:

- a properties sheet including, at a minimum, all specified properties, measured using test methods indicated in the project technical specifications, or equivalent;
- a list of quantities and descriptions of materials other than the base resin which comprise the pipe;
- the sampling procedure and results of testing; and

- a certification that property values given in the properties sheet are minimum values and are guaranteed by the HDPE Pipe Manufacturer.

The CQA Consultant will verify that:

- the property values certified by the HDPE Pipe Manufacturer meet all of the project technical specifications; and
- the measurements of properties by the HDPE Pipe Manufacturer are properly documented and that the test methods used are acceptable.

6.2.1 Verification and Identification

Prior to shipment, the HDPE Pipe Manufacturer will provide the Project Manager and the CQA Consultant with a quality control certification for each lot/batch of HDPE pipe provided. The quality control certificate will be signed by a responsible party employed by the HDPE Pipe Manufacturer, such as the Production Manger. The quality control certificate will include:

- lot/batch number and identification; and
- sampling procedures and results of quality control tests.

The CQA Consultant will:

- verify that the quality control certificates have been provided at the specified frequency for all lots/batches of pipe, and that each certificate identifies the pipe lot/batch related to it; and
- review the quality control certificates and verify that the certified properties meet the project technical specifications.

6.3 FUSION PROCESS

6.3.1 Preparation

All pipes, fittings, and every fusion joint will be inspected by the Pipe Installer. The Pipe Installer will ensure pipes and fittings are not broken, cracked, or contain otherwise damaged or unsatisfactory material.

Prior to fusing, the Pipe Installer will:

- ensure the fusion surface area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material.

6.3.2 Weather Conditions for Butt Fusion

Butt-fusion of HDPE pipe joints is normally done in uncontrolled atmospheres.

Unless authorized in writing by the Project Manager, no heat-fusion will take place below 40°F.

The CQA Consultant will verify that the general butt-fusion procedure has been followed by the Pipe Installer.

6.3.3 General Butt-Fusion Procedure

Unless otherwise specified, the general butt-fusion procedure used by the Pipe Installer will be as follows:

- be sure that the surfaces of the fusion tools, pipe, and fittings are free of contaminants;
- heat the surfaces to be joined - both the pipe and fittings - simultaneously at a prescribed temperature for a specified time;
- remove the heater - bring melted surfaces together; and
- hold until solidified.

These steps are described in more detail below.

- With a clean rag, wipe both inside and outside surfaces of the two ends to be joined to remove dirt and foreign material.
- Install pipe in fusion machine, allowing pipe ends to protrude 1 to 2 inches past face of jaw.
- Slide facer so that it can be placed between pipe ends. Cut pipe until the stops on each side of the facer are against the clamp bushings at the front and rear. Separate the two pipe ends by opening pipe jaws, turn off motor, and move facing unit to storage position. The ends are properly faced when BOTH stationary and movable clamps are against the stops on each side of the facing unit. This will ensure smooth, square pipe ends that will match perfectly when fusing.
- Bring the two pipe sections together and, with the fingers, feel for any high-low difference at the junction of the two ends. If necessary, tighten the appropriate inside clamp until the two sections are aligned as closely as possible. After facing pipe ends, if any adjustment is made on one or both inside clamps, the facing unit should be reinstalled and the pipe ends givens several turns with the cutter until the motor speeds up, before continuing with heating and fusing.
- Separate the two pipe sections. Slide heater to a position where it will come between pipe ends. Bring the movable pipe section against the heater until both pipe ends are in firm contact with the heater.
- During the heating period, as the pipe ends melt while against the heater, the molten plastic will expand and form a melt bead around the end of the pipe. The melted end will vary in width from about 1/16 to 3/16 inches, depending on pipe size, but should be 3/16 inch for 6 inches nominal diameter pipes or greater. The melt bead should be the same size on both pipe ends, and should be uniformly sized around the pipe.
- After melting has been completed as above, separate the pipe ends just enough to remove the heater and immediately bring the pipe ends together with the pressure recommended by the manufacturer.
- While maintaining the pressure used in making joints, allow the joint to cool for 30 to 90 seconds per inch of pipe diameter before removing from machine.

- Remove fused pipe sections from fusion machine. Allow joint to cool at least 20 minutes after removal before subjecting it to testing, bending, or backfilling stresses. Reposition fusion machine so that the end of the newly fused section lies in the stationary clamps while a new pipe section is placed in the movable clamps. Repeat fusion procedure.

6.4 NONDESTRUCTIVE TESTING

6.4.1 Nondestructive Testing of Joints

All non-perforated HDPE joints must be nondestructively tested. These pipe joints will be tested using the pressure test as provided in the project technical specifications. Other nondestructive test methods may be used only when:

- the Pipe Installer can prove its effectiveness;
- the method is approved by the Pipe Manufacturer; and
- the method is approved by the Project Manager.

Typical nondestructive joint testing methods include either water or air for pressure testing. The results shall be documented, including the amount of loss and the applied pressure readings. Gage readings shall be taken initially at 10-minute intervals and the gage should be capable of reading to the nearest 1 psi. Common water pressure meters are usually adequate for this purpose. If water is used, valving for relieving pressure as a result of temperature changes will be required. The Project Manager and the CQA Consultant will verify the effectiveness and validity of the test method.

The CQA Consultant will report any nonconformance of testing methods to the Project Manager.

SECTION 7.0
DRAINAGE COMPOSITE INSTALLATION QUALITY ASSURANCE

7.1 MANUFACTURING

The Drainage Composite Manufacturer will provide the Project Manager with a list of guaranteed properties for the type of drainage composite to be supplied. The Drainage Composite Manufacturer will provide the Project Manager with a written certification signed by a responsible party that the drainage composites actually delivered have properties which meet or exceed the guaranteed properties.

The CQA Consultant will examine all manufacturers' certifications to ensure that the property values listed on the certifications meet or exceed those specified. Any deviations will be reported to the Project Manager.

7.2 LABELING

The Drainage Composite Manufacturer will identify all rolls of drainage composite with the following:

- manufacturer's name;
- product identification;
- lot number;
- roll number; and
- roll dimensions.

The CQA Consultant will examine rolls upon delivery and any deviation from the above requirements will be reported to the Project Manager.

7.3 SHIPMENT AND STORAGE

Drainage composite cleanliness is essential to its performance; therefore, the drainage composite rolls may be wrapped in polyethylene sheets or otherwise protected against dust and dirt during shipping and storage.

The wrapping should be removed less than one hour before placement. The CQA Consultant will verify that drainage composites are free of dirt and dust just before installation. The CQA Consultant will report the outcome of this verification to the Project Manager, and if the drainage composites are judged dirty or dusty, they will be washed by the Drainage Composite Installer prior to installation.

Washing operations will be observed by the CQA Consultant and improper washing operations will be reported to the Project Manager.

7.4 HANDLING AND PLACEMENT

The Drainage Composite Installer will handle all drainage composites in such a manner as to ensure the drainage nets are not damaged in any way, and will comply with the following.

- If necessary, the drainage composite will be positioned by hand after being unrolled to minimize wrinkles. Drainage composites can be placed in the horizontal direction (i.e., across the slope) in some special locations (e.g., at the toe of a slope, if an extra layer of drainage composite is required, this extra layer of drainage composite can be placed in the horizontal direction). Such locations will be approved by the Project Manager.
- In the presence of wind, all drainage composites will be weighted with sandbags or the equivalent. Such sandbags will be installed during placement and will remain until replaced with overlying material.
- Drainage composites will not be welded to geomembranes.
- The Drainage composite Installer will take any necessary precautions to prevent damage to underlying layers during placement of the drainage composite.
- During placement of drainage composites, care will be taken not to entrap in the drainage composite dirt or excessive dust that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the drainage composite, it should be hosed clean prior to placement of the next material on top of it. In this regard, care should be taken with the handling of sandbags to prevent rupture or damage of the sandbag.

The CQA Consultant will note any noncompliance and report it to the Project Manager.

7.5 STACKING AND JOINING

When several layers of drainage composites are stacked, care should be taken to prevent strands from one layer from penetrating the channels of the next layer, thereby significantly reducing the transmissivity. This cannot happen if stacked drainage composites are placed in the same direction. A stacked drainage composite will never be laid in perpendicular directions to the underlying drainage composite (unless otherwise specified by the Engineer). In the corners of sideslopes of rectangular landfills, adjacent overlapping drainage composites are usually perpendicular, and special precautions will be taken as discussed below.

Adjacent drainage composites will be joined according to construction drawings and specifications. As a minimum, the following requirements will be met:

- adjacent rolls will be overlapped by at least 4 inches;
- these overlaps will be secured by tying, then seaming of the geotextiles;
- tying will be achieved by strings, plastic fasteners, or polymer braid. Tying devices will be white or yellow for easy observation. Metallic devices are not allowed;
- tying will be every 5 feet along slopes of 5H:1V or greater, and every 2 feet across the slope. Tying will be every 10 feet along slopes less than 5H:1V;

- in the corner of the sideslopes of rectangular landfills, where overlaps between perpendicular drainage composite strips are required, an extra layer of drainage composite will be unrolled along the slope, on top of the previously installed drainage composites, from top to bottom of the slope; and
- when more than one layer of drainage composite is installed, joints will be staggered, unless alternate means of joining adjacent panels is approved by the CQA Consultant and the Engineer.

The CQA Consultant will note any noncompliance and report it to the Project Manager.

7.6 REPAIR

Any holes or tears in the drainage composite will be repaired by placing a patch extending 2 feet beyond edges of the hole or tear. The patch will be secured to the original drainage net by tying every 6 inches and to the geotextile by heat bonding. Tying devices will be as indicated in Subsection 7.5. If the hole or tear extends across the roll more than 50 percent the width of the roll, the damaged area will be cut out and the two portions of the drainage composite will be joined as indicated in Section 7.5.

The CQA Consultant will observe any repair, note any noncompliance with the above requirements, and report them to the Project Manager.

7.7 PLACEMENT OF SOIL MATERIALS

All soil materials shall be placed in such a manner as to ensure:

- the drainage composite and underlying geomembrane are not damaged;
- minimal slippage of the drainage composite on the underlying geomembrane occurs; and
- no excess tensile stresses occur in the drainage composite.

Any noncompliance will be noted by the CQA Consultant and reported to the Project Manager.

SECTION 8.0
GCL INSTALLATION QUALITY ASSURANCE

8.1 MANUFACTURING

The Contractor will provide the CQA Consultant with a list of guaranteed "minimum average roll value" properties for the geosynthetic clay liner (GCL) to be delivered. The Contractor will also provide the CQA Consultant with a written certification from the GCL Manufacturer that the materials actually delivered have "minimum average roll value" properties which meet or exceed all property values guaranteed for the GCL.

The CQA Consultant will examine all manufacturer certifications to determine if the property values listed on the certifications meet or exceed those specified for the GCL. Any deviations will be reported to the Engineer.

8.2 LABELING

The GCL Manufacturer will identify all rolls of GCL in conformance with the project specifications. The CQA Consultant will examine rolls upon delivery and any deviation from the above requirements will be reported to the Engineer.

8.3 SHIPMENT AND STORAGE

During shipment and storage, the GCL will be protected as required by the project specifications. The CQA Consultant will observe rolls upon delivery at the site and any deviation from the above requirements will be reported to the Engineer.

8.4 HANDLING AND PLACEMENT

The Geosynthetic Installer will handle the GCL in such a manner as required by the project specifications. Any noncompliance will be noted by the CQA Consultant and reported to the Engineer.

8.5 SEAMS AND OVERLAPS

The GCL will be seamed or overlapped in accordance with project specifications or as approved by the CQA Consultant and Engineer.

8.6 REPAIR

Any holes or tears in the GCL will be repaired in accordance with the project specifications. The CQA Consultant will observe any repair and note any noncompliance with the above requirements and report them to the Engineer.

8.7 PLACEMENT AND MATERIALS

All soil materials located on top of the GCL shall be placed in accordance with the project specifications. Any noncompliance will be noted by the CQA Consultant and reported to the Engineer.

SECTION 9.0

CONSTRUCTION QUALITY ASSURANCE DOCUMENTATION

9.1 DOCUMENTATION

An effective CQA/CQC Plan depends largely on recognition of all construction activities that should be observed, and on assigning responsibilities for the observing of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Consultant will document that all quality assurance requirements have been addressed and satisfied.

The CQA Consultant will provide the Project Manager with the CQA Consultant's daily and weekly reports including signed descriptive remarks, data sheets, and logs to verify that all observing activities have been carried out. The CQA Consultant will also maintain at the job site a complete file of plans, reports, and project technical specifications, a CQA/CQC Plan, checklists, test procedures, daily logs, and other pertinent documents.

9.2 RECORDKEEPING

Standard reporting procedures will include preparation of a daily report which, at a minimum, will consist of: (a) field notes, including memoranda of meetings and/or discussions with the Contractor; (b) observation logs, and testing data sheets; and (c) construction problem and solution data sheets. This information will be submitted weekly to and reviewed by the Project Manager. The daily report must be completed at the end of each CQA Consultant's shift, prior to leaving the site, and submitted to the CQA Consultant.

The weekly reports should summarize the major events that occurred during that week. Critical problems that occur shall be communicated verbally immediately as well as being included in the reports.

9.2.1 Memorandum of Discussion with Contractor or Geosynthetic Installer

A daily report will be prepared summarizing discussions between the CQA Consultant and Contractor or Geosynthetic Installer. At a minimum, the daily report will include the following information:

- date, project name, location, and other identification;
- name of parties to discussion at the time;
- relevant subject matter or issues;
- activities planned and schedule; and
- signature of the CQA Consultant.

9.2.2 Observation Logs and Testing Data Sheets

Observation logs and testing data sheets will be prepared daily by the CQA Consultant and/or the Geomembrane Installer.

At a minimum, these logs and data sheets will include the following information:

- an identifying sheet number for cross referencing and document control;
- date, project name, location, and other identification;
- data on weather conditions;
- a reduced-scale Site Plan showing all proposed work areas and test locations;
- descriptions and locations of ongoing construction;
- descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;
- locations where tests and samples were taken;
- a summary of test results;
- calibrations or recalibrations of test equipment, and actions taken as a result of recalibration;
- off-site materials received, including quality verification documentation;
- decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality; and
- the CQA Consultant's and/or Geomembrane Installer's signature.

9.2.3 Construction Problem and Solution Data Sheets

Sheets describing special construction situations will be cross-referenced with specific observation logs and testing data sheets, and must include the following information, where available:

- an identifying sheet number for cross referencing and document control;
- a detailed description of the situation or deficiency;
- the location and probable cause of the situation or deficiency;
- how and when the situation or deficiency was found or located;
- documentation of the response to the situation or deficiency;
- final results of any responses;
- any measures taken to prevent a similar situation from occurring in the future; and
- the signature of the CQA Consultant, and signature of the Project Manager indicating concurrence.

The Project Manager will be made aware of any significant recurring non-conformance with the project technical specifications. The Project Manager will then determine the cause of the non-conformance and recommend appropriate changes in procedures or specification. When this type of evaluation is made, the results will be documented, and any revision to procedures or project technical specifications will be approved by the Owner and Engineer.

9.3 PHOTOGRAPHIC REPORTING DATA SHEETS

Photographic reporting data sheets, where used, will be cross-referenced with observation logs and testing data sheet and/or construction problem and solution data sheet. Photographs shall be taken at regular intervals during the construction process and in all areas deemed critical.

These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. The basic file will contain color prints; digital copies will also be stored in a separate file in chronological order. These records will be presented to the Project Manager upon completion of the project.

In lieu of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities. The Project Manager may require that a portion of the documentation be recorded by photographic means in conjunction with video taping.

9.4 DESIGN AND/OR PROJECT TECHNICAL SPECIFICATION CHANGES

Design and/or project technical specification changes may be required during construction. In such cases, the CQA Consultant will notify the Project Manager and the Engineer. The Project Manager will then notify the appropriate agency, if necessary.

Design and/or project technical specification changes will be made only with the written agreement of the Project Manager and the Engineer, and will take the form of an addendum to the project technical specifications. All design changes shall include a detail (if necessary) and state which detail it replaces in the plans.

9.5 PROGRESS REPORTS

The CQA Consultant will prepare a summary progress report each week, or at time intervals established at the pre-construction meeting. As a minimum, this report will include the following information:

- a unique identifying sheet number for cross-referencing and document control;
- the date, project name, location, and other information;
- a summary of work activities during progress reporting period;
- a summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period;
- a summary of test results, failures and retests, and
- a signature of the CQA Consultant.

9.6 SIGNATURE AND FINAL REPORT

At the completion of each major construction activity at the Landfill unit, the CQA Consultant will submit all required forms, observation logs, field and laboratory testing data sheets including sample location plans, construction problems and solution data sheets for certification by the Certifying Engineer. The engineer will also provide a final report which will certify that the work has been performed in compliance with the plans and project technical specifications, and that the supporting documents provide the necessary information.

The Certifying Engineer will also provide summaries of all the data listed above with the report. The Record Drawings will include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.). All surveying and base maps required for development of the Record Drawings will be done by the Construction Surveyor. These documents will be submitted by the Construction Surveyor to the Contractor for review and certification and delivered to the CQA Consultant and included as part of the CQA documentation (Certification) report.

It may be necessary to prepare interim certifications, as allowed by the regulatory agency to expedite completion and review.

9.7 STORAGE OF RECORDS

All handwritten data sheet originals, especially those containing signatures, should be stored by the Project Manager in a safe repository on-site. Other reports may be stored by any standard method which will allow for easy access. All written documents will become property of the Owner.

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ATTACHMENT III-4
Calculations

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DESIGN CALCULATIONS

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Prepared by:

HDR Engineering, Inc.

August 2008

Revised February 2009

Revised March 2010

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TABLE OF CONTENTS

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INTERMEDIATE STABILITY

HDR | ONE COMPANY *Many Solutions*℠

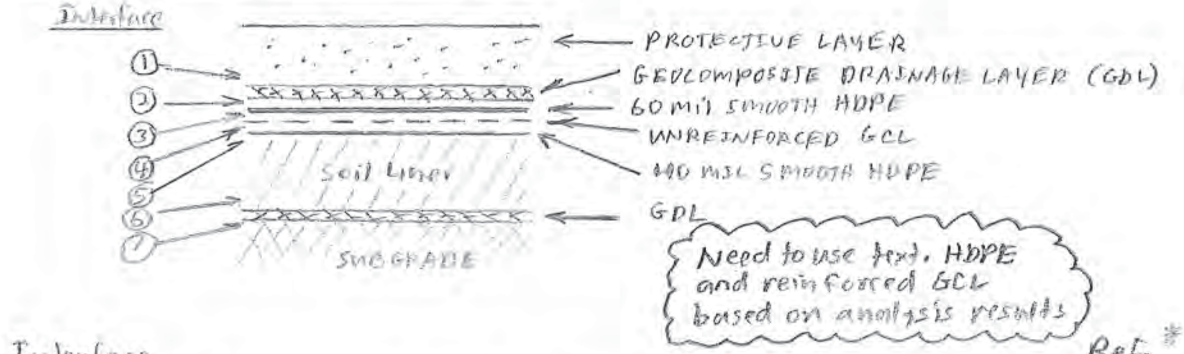
Project:	SPSA	Computed:	JMY	Date:	6/2/08
Subject:	Cell VII Part B	Checked:	DTD	Date:	8/27/08
Task:	Intermediate Stability	Page:	1	of:	4
Job #:	00018-J889-011	No:			

PURPOSE: Evaluate Cell VII Stability for intermediate condition (i.e. Cell VII partially full).

PROCEDURE:

1. Evaluate interface strength of geosynthetic components of Cell VII liner system;

Proposed Bottom Liner System



	Interface		Ref.*
	① Protective Layer / Geocomposite (GDL)	$\phi = 27^\circ$, $C = 14\ kPa = 292\ psf$	Att. A
	② GDL / 60-mil Smooth HDPE	$\phi = 15^\circ$, $C = 0$	Att. B
**	③ 60-mil Smooth HDPE / unreinf. GCL	$\phi = 0$, $C = 50\ psf$	(Hydrated Project Spec.)
**	④ Unreinf. GCL / 40-mil Smooth HDPE	$\phi = 0$, $C = 50\ psf$	" "
	⑤ 40-mil Smooth HDPE / soil liner	$\phi = 11^\circ$, $C = 7\ kPa = 146\ psf$	Att. C
	⑥ Soil Liner / GDL	$\phi = 30^\circ$, $C = 5\ kPa = 104\ psf$	Att. D
	⑦ GDL / Subgrade	$\phi = 30^\circ$, $C = 5\ kPa = 104\ psf$	Att. D

* Note: All interface strength values are peak values. Residual values not used because site is not in seismic impact zone and movements along liner reqd. to achieve residual values are not anticipated.

** By inspection, this is critical interface.

Proposed Sideslope Liner System

Interface

Need to increase to 16° based on results of Stability Analysis.

Interface			Ref.
①	(Same as bottom liner)		
②	GDL/60 mil Text. HDPE	$\phi = 26^\circ$, $C = 0$	Att. E
* ③	60 mil Text. HDPE / reinf. GCL	$\boxed{\phi = 12^\circ}$, $C = 0$ psf	(Updated Project Spec)
* ④	Reinf. GCL/40 mil Text HDPE	$\boxed{\phi = 12^\circ}$, $C = 0$ psf	(Updated Project Spec)
⑤	40 mil Text HDPE/ Soil liner	$\phi = 18^\circ$, $C = 10\,kPa = 201\,psf$	Att. F
⑥	(Same as bottom liner)		
⑦	(Same as bottom liner)		

* By inspection, these are critical interfaces.

2. Select strength properties of MSW:

Based on information in Attachment G, use $\phi = 21^\circ$, $C = 200\,psf$ ($9.6\,kN/m^2$). This value is within range observed in laboratory and field.

3. Evaluate Intermediate Stability (sliding block along liner)

See Att. H and I for critical intermediate condition cross-section location where waste height is max. and basegrade slope along liner surface is most conducive to sliding. Input cross section into STABL5M to run stability analysis.

STABL5M sliding block searching routine indicates factor of safety with unreinforced GCL and smooth HDPE on Cell VII bottom liner is below 1.0. Need to use sideslope liner system in bottom liner system as well which has textured HDPE and reinforced GCL. Also need to increase regd. minimum strength of interface shear strength testing from 12° to 16° to get min. FS = 1.5. Based on tests previously performed for Cell III liner system, this increase in strength requirements should be readily attainable.

Summary of STABL5M Liner Interface Analysis

File Name		Analysis	Min. FS
INTERMED	(Att. J)	Sliding block along bottom liner and slope liner	1.80
INTER4	(Att. K)	Sliding block along bottom liner (search)	1.50

4. Evaluate Intermediate Stability (Circular Arc through Waste)

Use Bishop method circular arc searching routine in STABL5M to determine stability of waste under this mode of failure. Use LIMITS function to keep failure surface within waste.

From Att. L, Min FS = 1.57 > 1.5 OK

5. Evaluate Intermediate Stability (Bearing Capacity of Cell Floor)

Use Bishop method circular arc searching routine in STABL5M to determine whether deep seated bearing capacity failure is likely in foundation soils during intermediate filling condition.

Estimate drained and undrained strength parameters for foundation soils using results from consolidated undrained triaxial test on Cell VII soil sample obtained from a depth of 34.1-35.7 feet (Att. M)

∴ Undrained parameters: $c = 190$ psf, $\phi = 30°$ *

∴ Drained parameters: $\bar{c} = 235$ psf, $\bar{\phi} = 36°$ **

* Undrained parameters applicable for rapid loading conditions before excess pore pressures in soils can dissipate.
** Drained parameters applicable for slow loading conditions where excess pore pressures in soils have time to dissipate.

Estimate unit weight of foundation soils using typical values measured from Shelby tube sample obtained from a depth of 34.1 – 35.7 feet (Att. N).

$\therefore \gamma \approx 115 \text{ lb/ft}^3$

Determine potentiometric surface in foundation soils:

Assume groundwater is at liner surface within Cell VII (i.e. groundwater pumps are on) and potentiometric surface on bottom liner within Cell V is at natural ground elevation ≈ el. 25 (i.e. gw pumps are off).

Inputting these data values into STABL5M yields analyses shown on Att. O and P:

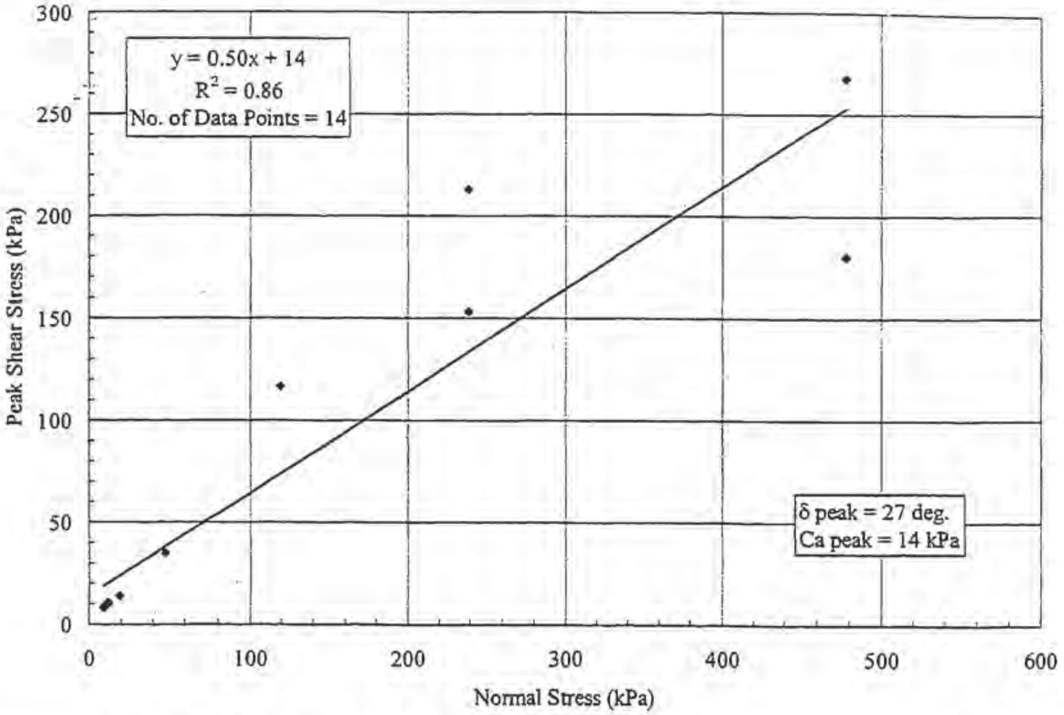
Summary of STABL5M Analysis
(Bearing Capacity of Cell Floor)

File Name	Analysis	Min. FS	Att.
INTER 6	Undrained	1.78	O
INTER 7	Drained	1.87	P

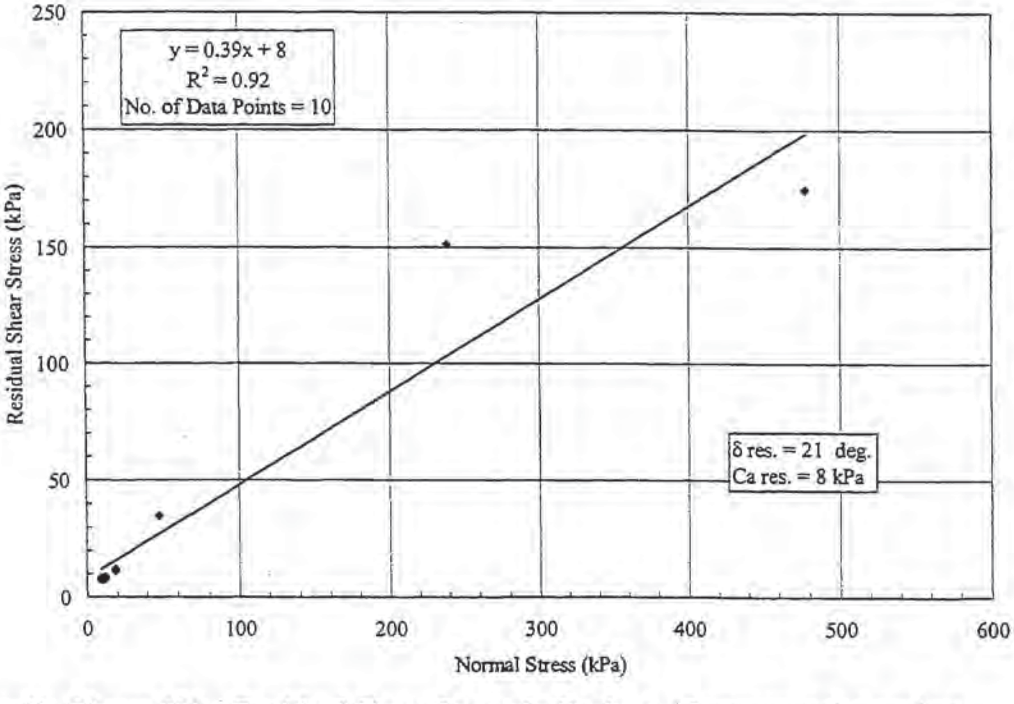
CONCLUSION:

Proposed worst-case Cell VII intermediate filling condition is stable with all slope stability analyses yielding minimum factors of safety of 1.5 and above.

ATTACHMENT A



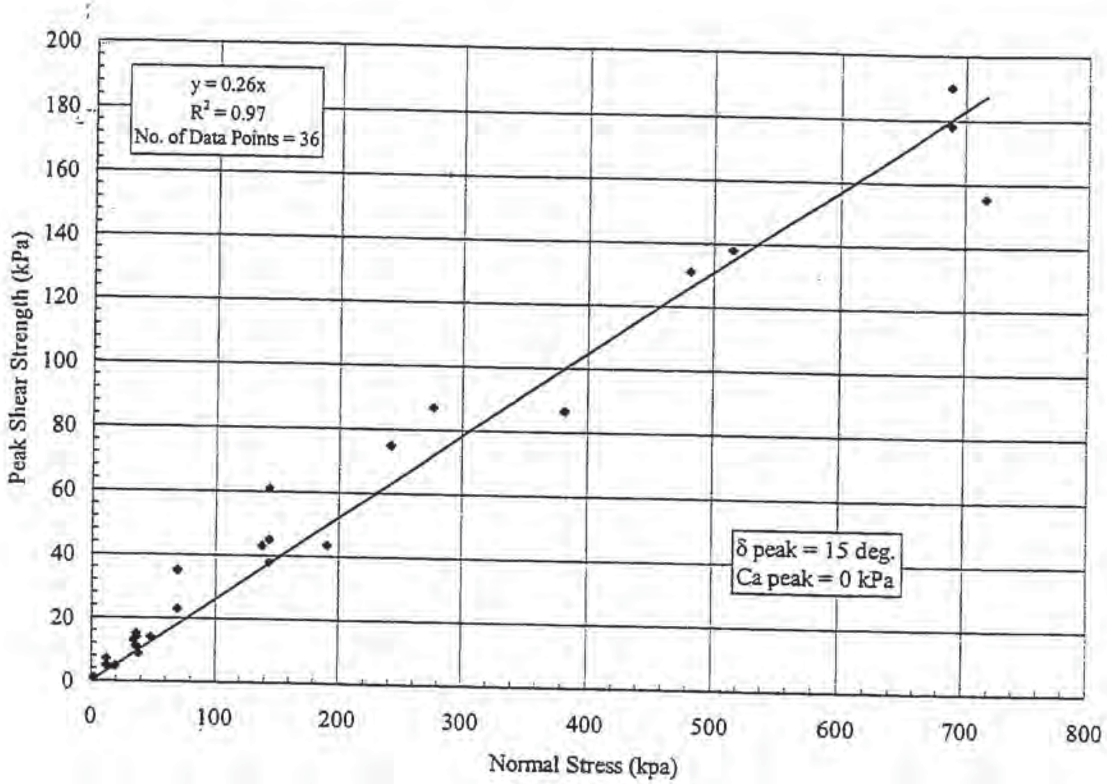
Appendix Figure 13a - Peak Shear Strength; Drainage Geocomposite against Granular Soil.



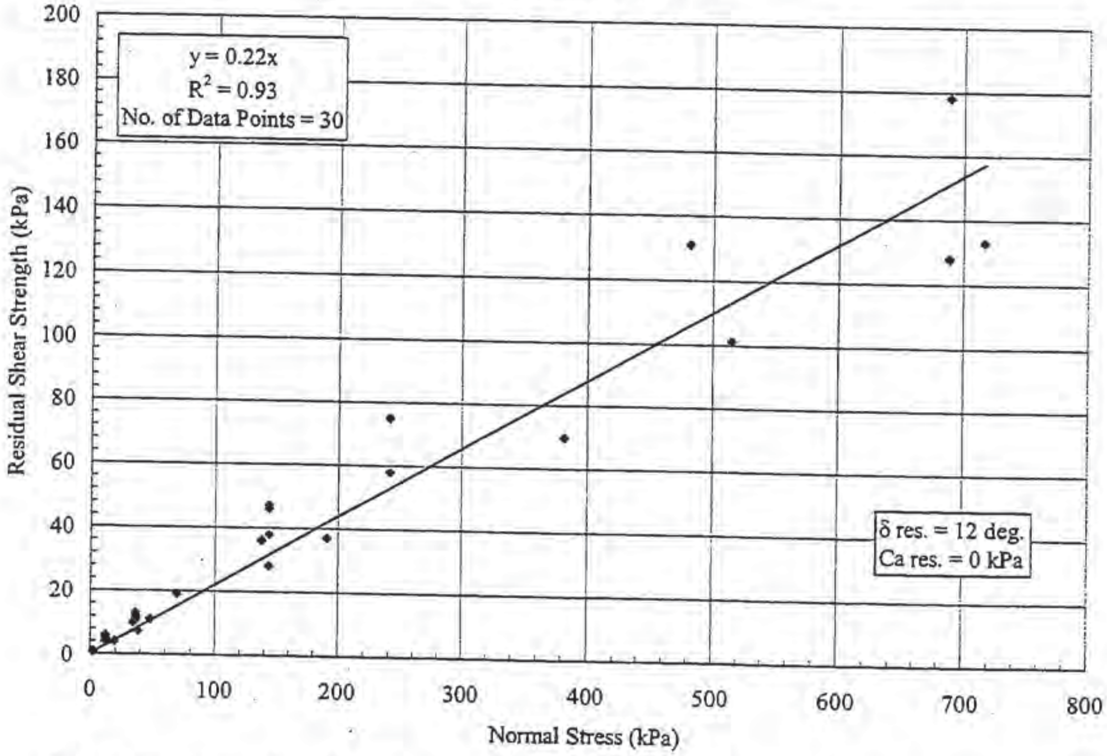
Appendix Figure 13b - Residual Shear Strength; Drainage Geocomposite against Granular Soil.

Source: GRI Report #30
June 14, 2005

ATTACHMENT B



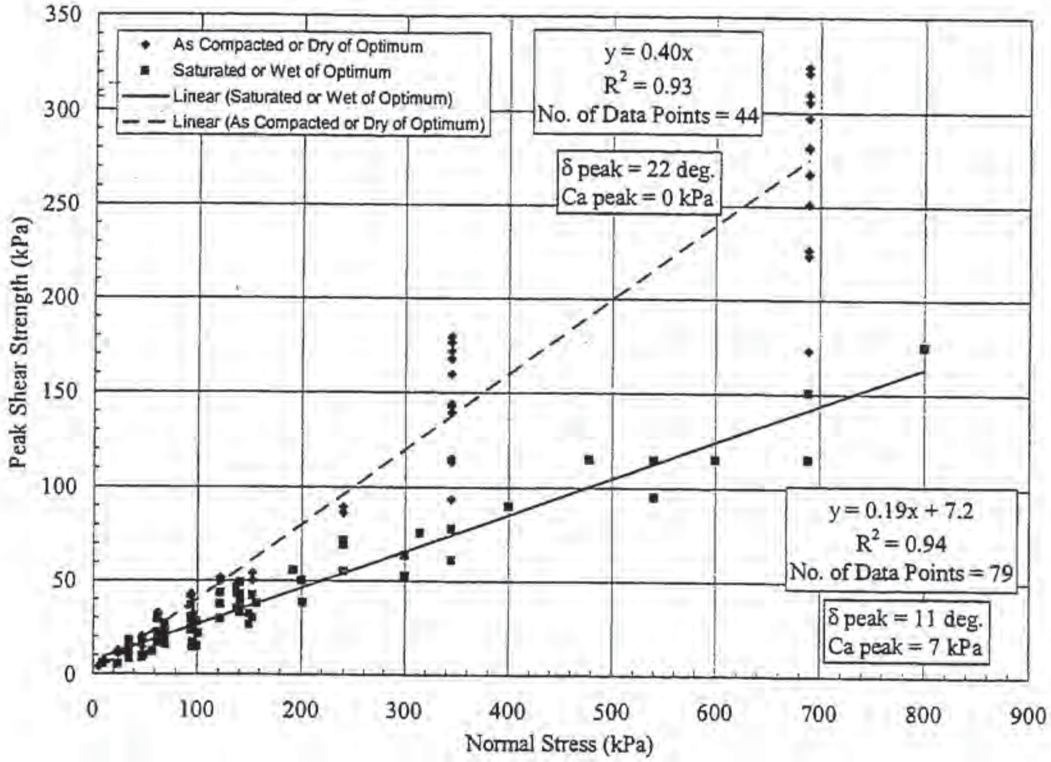
Appendix Figure 1i – Peak Shear Strength; Smooth HDPE against NW-NP Geotextile on Drainage Geocomposite.



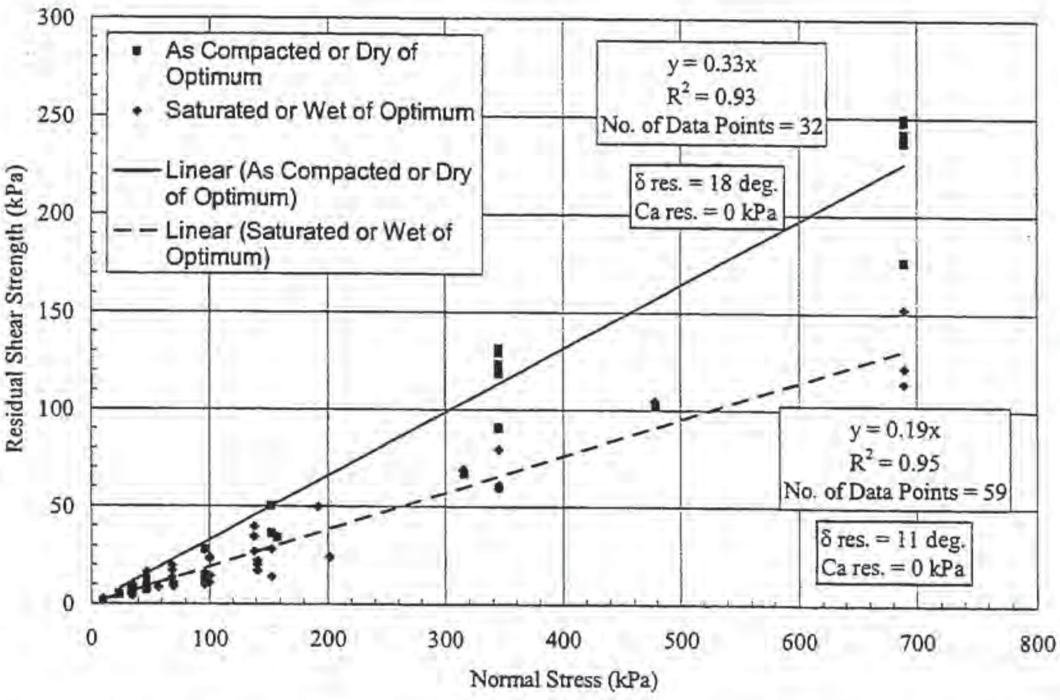
Appendix Figure 1j – Residual Shear Strength; Smooth HDPE against NW-NP Geotextile Drainage Geocomposite.

Source: GRI Report #30
June 14, 2005

ATTACHMENT C



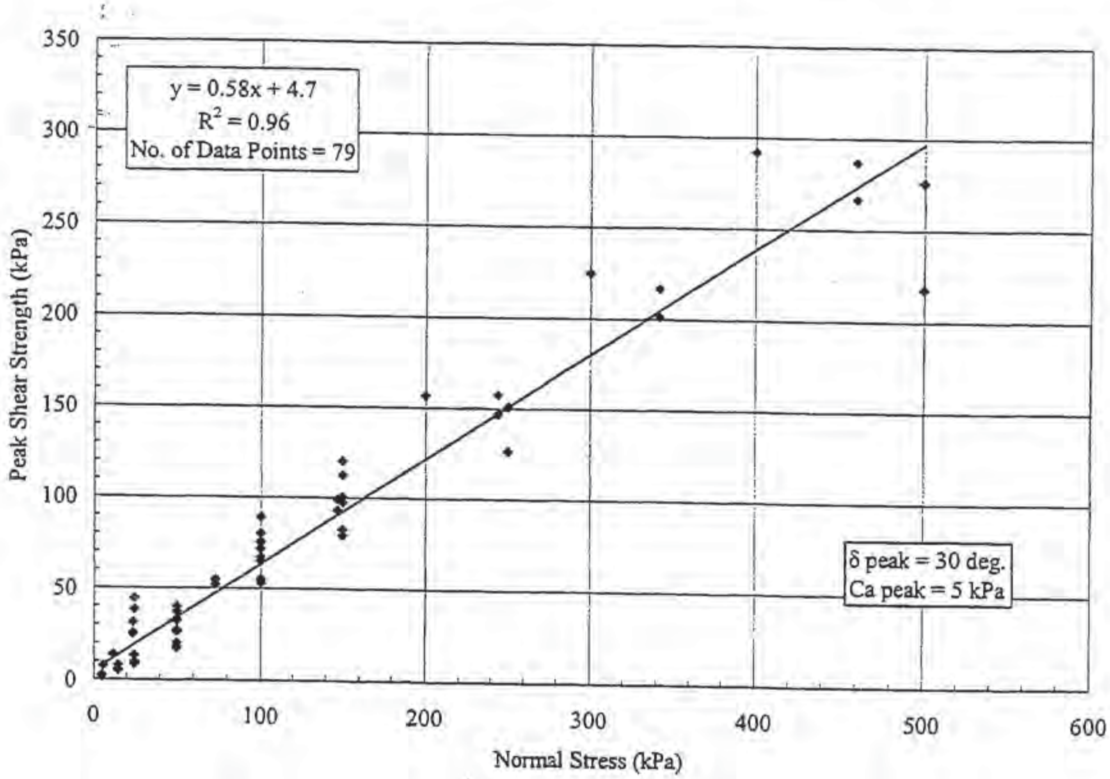
Appendix Figure 1c – Peak Shear Strength; Smooth HDPE against Cohesive Soil.



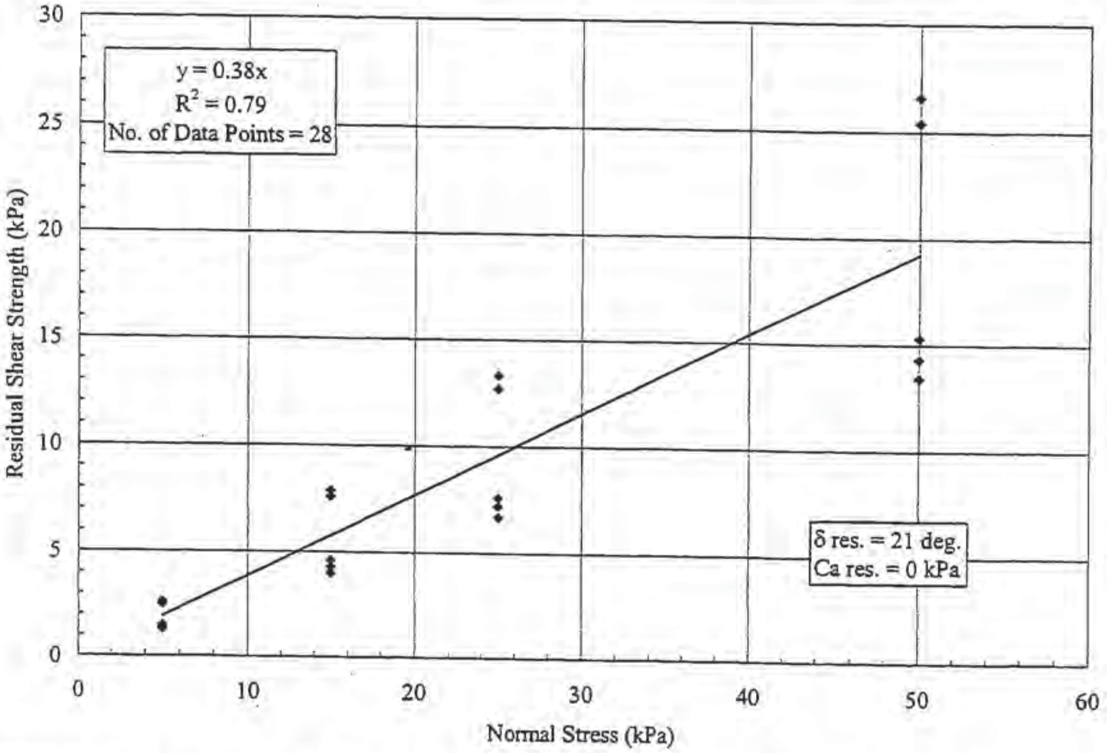
Appendix Figure 1d – Residual Shear Strength; Smooth HDPE against Cohesive Soil.

Source: GRI Report #30
June 14, 2005

ATTACHMENT D



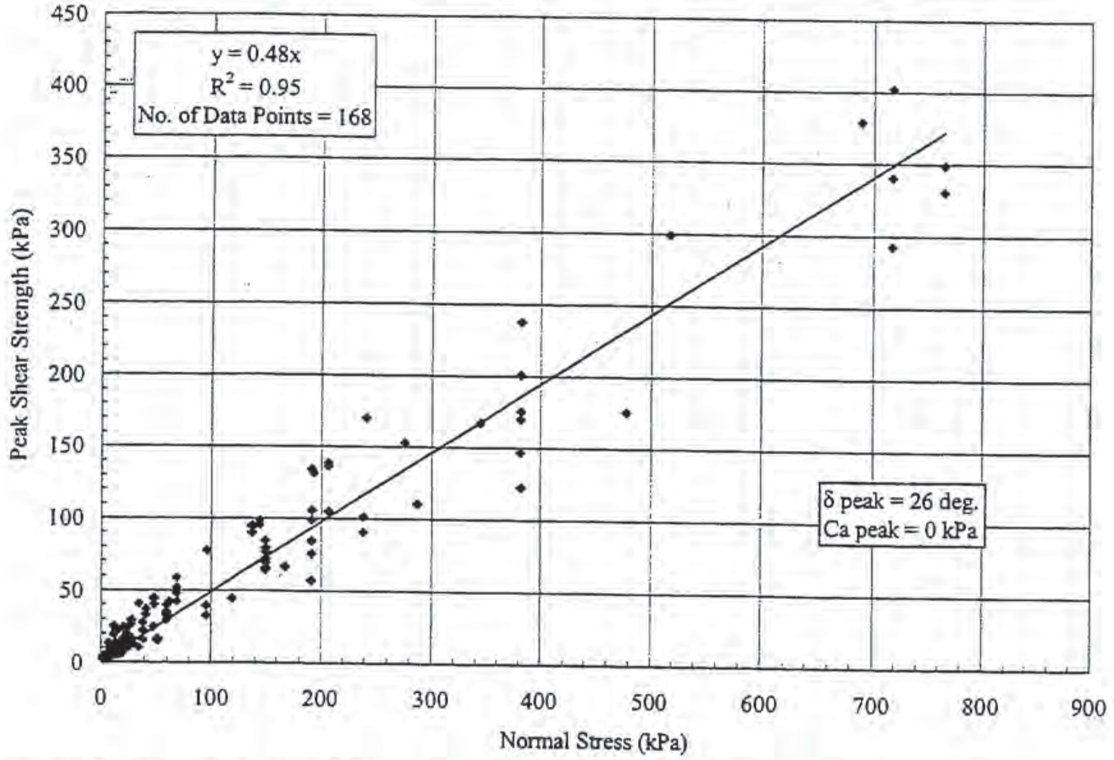
Appendix Figure 9a - Peak Shear Strength; NW-NP Geotextile against Cohesive Soil.



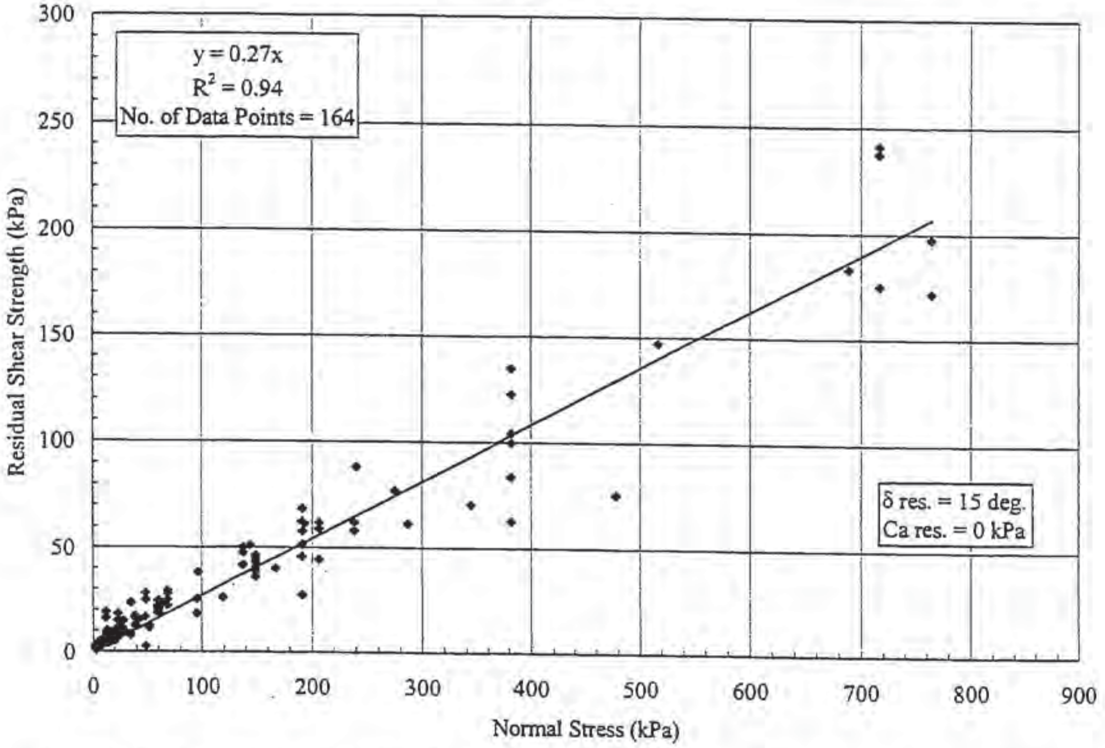
Appendix Figure 9b - Residual Shear Strength; NW-NP Geotextile against Cohesive Soil.

Source: GRI Report #30
June 14, 2005

ATTACHMENT E



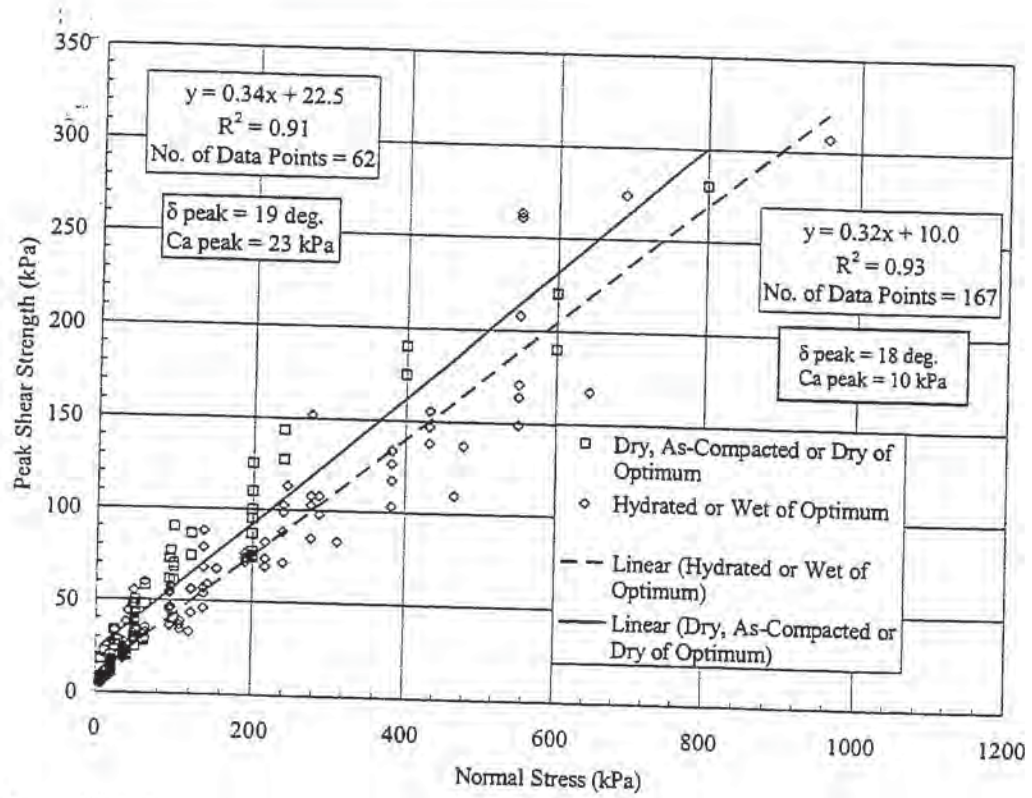
Appendix Figure 2i – Peak Shear Strength; Textured HDPE against NW-NP Geotextile on a Drainage Geocomposite.



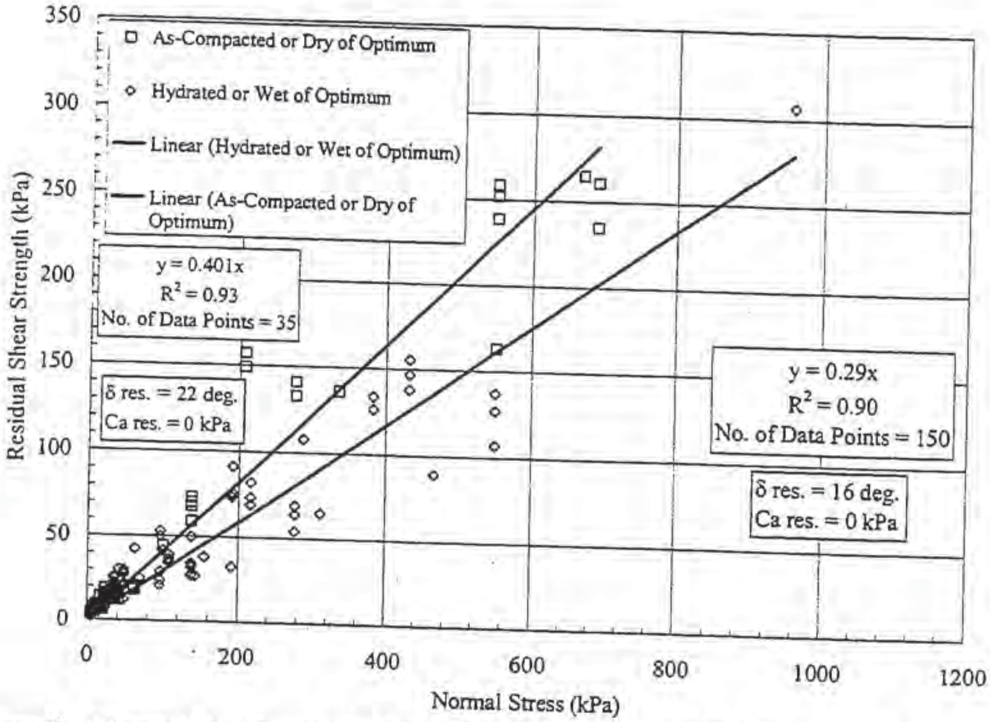
Appendix Figure 2j – Residual Shear Strength; Textured HDPE against NW-NP Geotextile on a Drainage Geocomposite.

Source: GRI Report # 30
June 14, 2005

ATTACHMENT F



Appendix Figure 2c – Peak Shear Strength; Textured HDPE against Cohesive Soil.

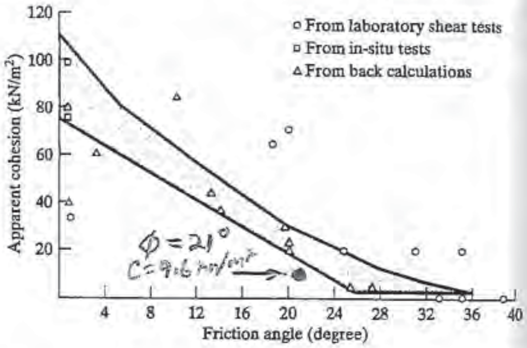


Appendix Figure 2d – Residual Shear Strength; Textured HDPE against Cohesive Soil.

Source: GRI Report #30
[illegible]

Source: Geotechnical Aspects of Landfill
Design and Construction

FIGURE 6.7 Summary of Municipal Solid Waste Strength Data (Singh and Murphy, 1990)



then plotted on a single figure, reproduced herein as Figure 6.7. The shaded zone in Figure 6.7 is the range of strength parameters Singh and Murphy recommend for use in stability analyses.

In an assessment of the shear strength of municipal solid waste, Kavazanjian et al. (1995) recognized that factors such as waste compressibility and strain compatibility should be considered when developing strength parameters for limit equilibrium analysis. Their assessment of the waste shear strength was based primarily on shear strengths back-calculated from case histories and the results of in-situ testing. With the exception of one set of data from large-scale tests, laboratory test data on the waste shear strength was not used. The excluded laboratory data was not considered reliable due to either the use of processed waste in the testing program or the small size of the waste samples relative to size nonhomogeneity in municipal solid waste landfills. Field and laboratory test data that they considered being reliable and used in their re-evaluation of the waste shear strength are summarized in Table 6.10.

Kavazanjian et al. (1995) supplemented the data in Table 6.10 with data from back-analyses of existing solid waste landfill slopes known to be stable. Table 6.11 presents back-calculated waste shear strength from four existing landfills. The back-calculated friction angles for municipal solid waste presented in Table 6.11 were obtained assuming a cohesion of 5 kPa (100 psf) using the modified Bishop method of slices. As the slopes at these landfills have been standing for up to 15 years without excessive deformation or other signs of impending instability, the factors of safety against slope failure within the waste are certainly larger than 1.0 and probably greater than 1.3. To be conservative, the results for a factor of safety of 1.2 were used in the waste shear strength assessment.

The shear strength from Tables 6.10 and 6.11 are plotted versus normal stress in Figure 6.8. The data plotted in Figure 6.8, combined with the observation from landfill operations with stable trenches excavated in the waste with vertical faces in excess of 6 m in height, appear to support a bilinear representation of the waste shear strength (Kavazanjian et al., 1995). A vertical slope in a soil (or waste) requires the presence of some apparent cohesion. A "sliding wedge" analysis shows that the minimum cohesion for a frictionless ($\phi = 0$) material and a vertical slopes ($\beta = 90°$) is given by the following equation:

TABLE 6.10 Data Used in MSW Shear Strength Re-Evaluation (Kavazanjian et al., 1995)

Reference	Data Type	Results	Comments
Pagotto & Rimoldi (1987)	Back-calculation from plate bearing tests	$\phi = 22°$, $c = 605$ psf (29 kPa)	No data on waste types or test procedures are provided.
Landva & Clark (1990)	Laboratory direct shear tests on MSW	$\phi = 24°$, $c = 460$ psf (22 kPa) to $\phi = 39°$, $c = 400$ psf (19 kPa)	Normal stresses up to 10,000 psf (480 kPa). Low strength not used in Figure 6.7, corresponds to shredded waste.
Richardson & Reynolds (1991)	Large direct shear tests performed in-situ	$\phi = 18°$ to $43°$, $c = 210$ psf (10 kPa)	Normal stresses range from 300 to 800 psf (14 to 38 kPa). Unit weight of waste and cover estimated as 95 lb/ft³ (15 kN/m³).

Used with permission of ASCE.

$$c_{\min}|_{\phi=0,\beta=90°} \geq H \cdot \gamma/4$$

Based on this observation and the data plotted in Figure 6.8, a Mohr-Coulomb strength envelope consisting of $\phi = 0$ with $c = 24$ kPa (500 psf) at normal stress below 30 kPa (625 psf) and $\phi = 33°$ with $c = 0$ at higher normal stresses was developed by Kavazanjian et al. (1995) for use in stability analyses of municipal solid waste landfills.

For the long-term stability, any change in shear parameters will depend on the nature of the waste. For municipal solid waste, there is no direct evidence that shear strength parameters change significantly with time. On the other hand, it is reasonable to believe that shear strength should change as the waste degrades and decomposes. The overall shear strength could decrease, for example, if there is substantial local decomposition that leaves weak zones or cavities, but this type of deterioration could not be detected easily through relatively small-scale laboratory shear tests.

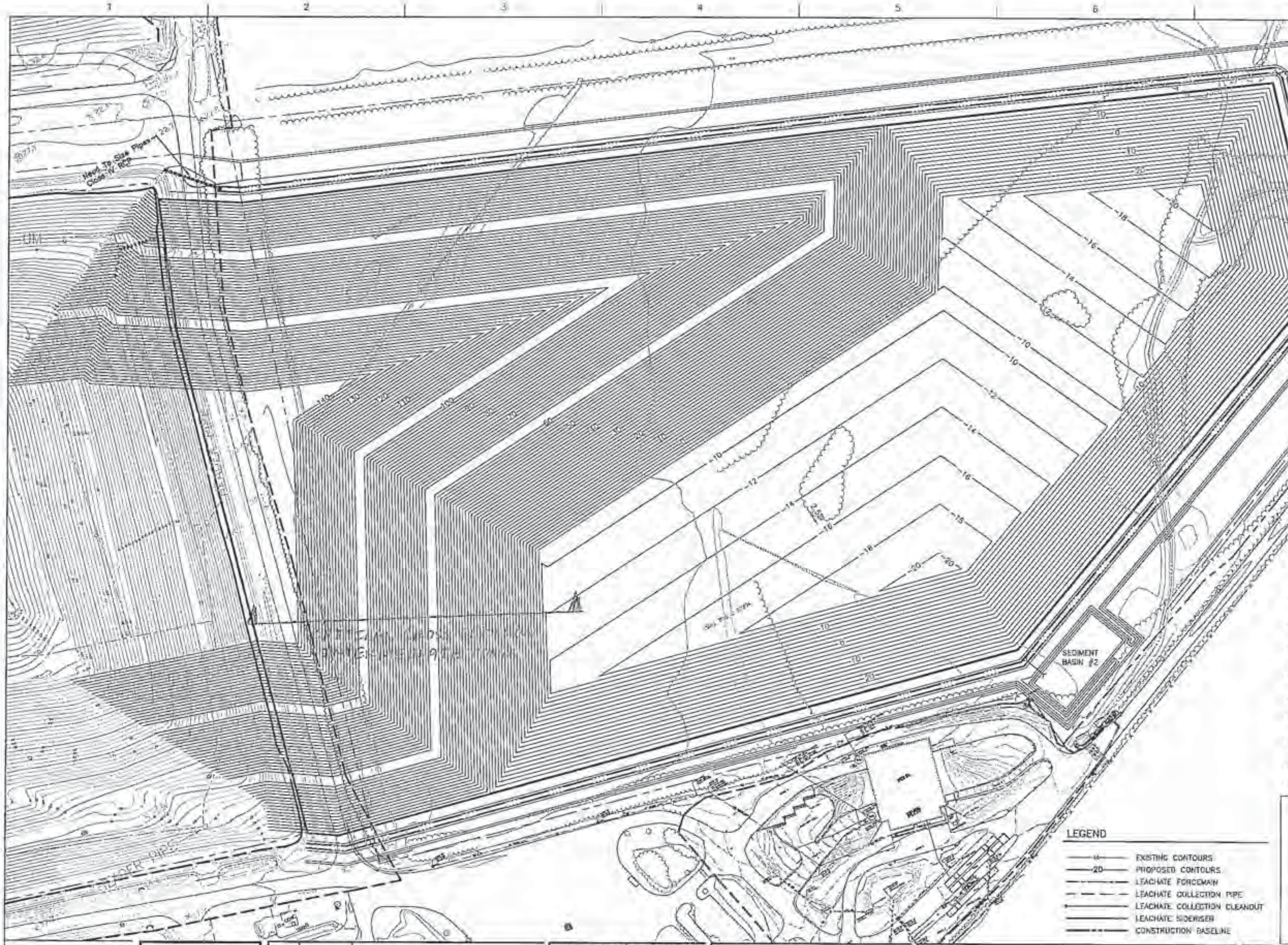
TABLE 6.11 Back-Analysis of Existing Landfill Slopes (Kavazanjian et al., 1995)

Landfill	Average Slope		Maximum Slope		Waste Strength, ϕ		
	Height (m)	Slope (H:V)	Height (m)	Slope (H:V)	$FS = 1.0$	$FS = 1.1$	$FS = 1.2$
Lopez Canyon, CA	120	2.5:1	35	1.7:1	25°	27°	29°
OII, CA	75	2:1	20	1.6:1	28°	30°	34°
Babylon, NY	30	1.9:1	10	1.25:1	30°	34°	38°
Private Landfill, OH	40	2:1	10	1.2:1	30°	34°	37°

Note: FS = Factor of safety for back-analysis assuming $c = 5$ kPa (100 psf).
Used with permission of ASCE.

ATTACHMENT G

ATTACHMENT H

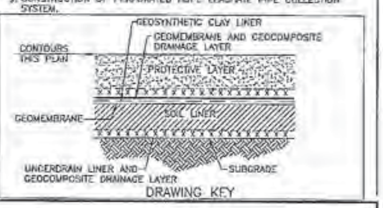


NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I–IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I–IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE I SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM AERIAL PHOTOGRAPHY DATED DECEMBER 27, 2007.
5. AS-BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL-SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
7. ALL ELEVATIONS ARE AS PER USGS DATUM.

GRADING DEVELOPMENT CONSISTS OF:

1. SUBGRADE PREPARATION AND TRENCHING FOR PLACEMENT OF THE GROUNDWATER COLLECTION SYSTEM.
2. PLACEMENT OF A GEONET WITH FILTER FABRIC BONDED TO EACH SIDE (GEOCOMPOSITE DRAIN) AS AN UNDERDRAIN.
3. PLACEMENT OF A ONE FOOT LOW PERMEABILITY COMPACTED SOIL LINER ON THE GEOCOMPOSITE DRAIN (K<1x10 CM/SEC)
4. INSTALL 40 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH SOIL LINER.
5. INSTALL A GEOSYNTHETIC CLAY LINER.
6. INSTALL 60 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GCL.
7. PLACEMENT OF A GEOCOMPOSITE DRAIN WITH FILTER FABRIC BONDED TO EACH SIDE FOR THE LEACHATE COLLECTION SYSTEM.
8. PLACEMENT OF A 1.5 FOOT PERMEABLE PROTECTIVE COVER LAYER.
9. CONSTRUCTION OF PERFORATED HDPE LEACHATE PIPE COLLECTION SYSTEM.



DRAWING KEY

LEGEND

—16— EXISTING CONTOURS
—20— PROPOSED CONTOURS
LEACHATE FORCEMAIN
LEACHATE COLLECTION PIPE
LEACHATE COLLECTION CLEANOUT
LEACHATE SIDERISER
CONSTRUCTION BASELINE

HDR

HDR Engineering, Inc.
of the Carolinas

ISSUE	DATE	DESCRIPTION
		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
	D.T. DECESARE, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill
Proposed Cell VII

Part B Application

SUFFOLK VIRGINIA

PHASE 2 TOP OF OPERATIONAL COVER

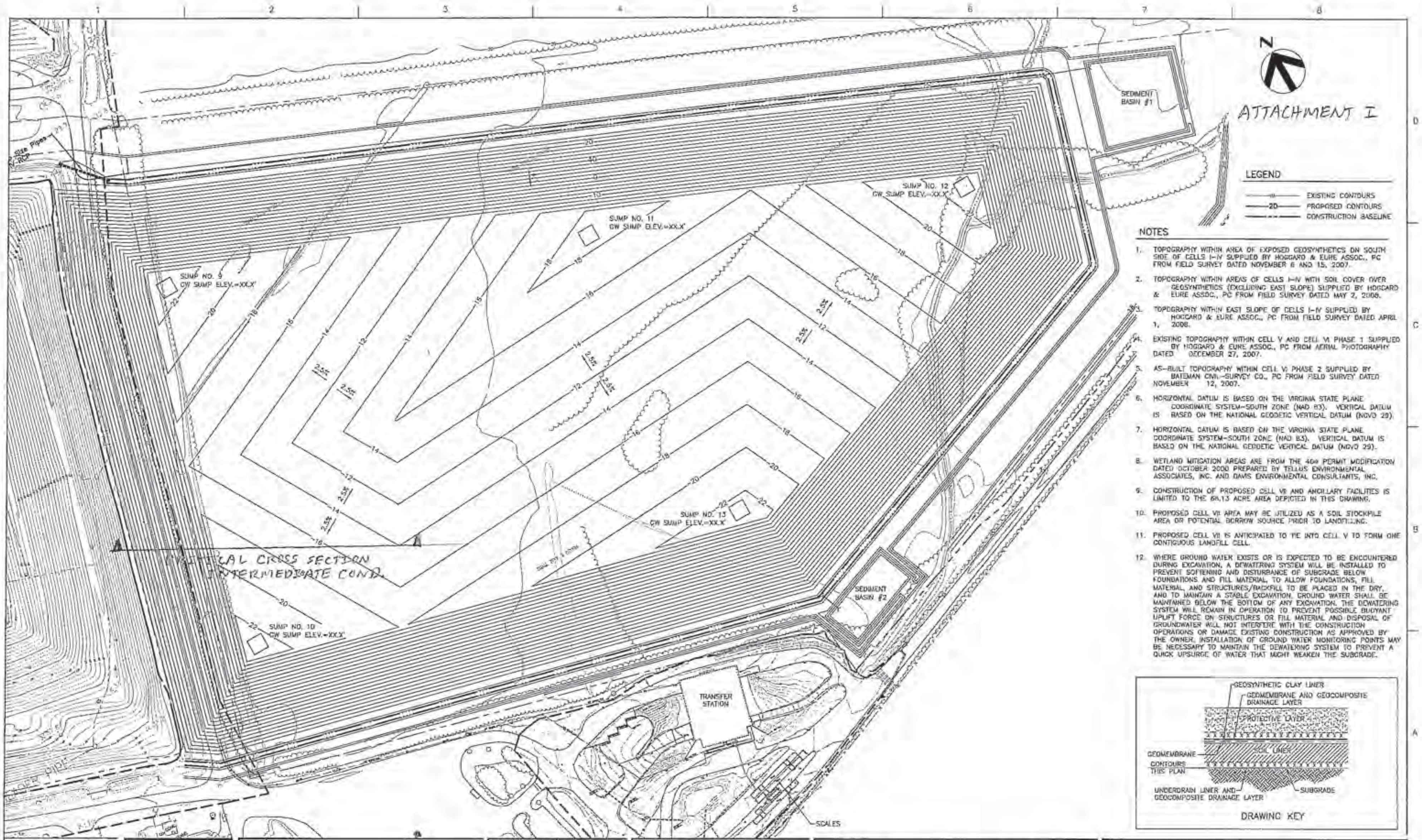
0 1" 2"

FILENAME	00C-05.dwg
SCALE	~~1"=200'~~ 100'

SHEET C-05

C:\PWworking\TPA\dms93507\00C-05.dwg, Plot, 6/2/2008 1:37:25 PM, gwilliam

ATTACHMENT I



DRAWING KEY

LEGEND

—10—	EXISTING CONTOURS
—20—	PROPOSED CONTOURS
——·—·——	CONSTRUCTION BASELINE

NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I-IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I-IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I-IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM AERIAL PHOTOGRAPHY DATED DECEMBER 27, 2007.
5. AS-BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL-SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
7. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
8. WETLAND MITIGATION AREAS ARE FROM THE 404 PERMIT MODIFICATION DATED OCTOBER 2000 PREPARED BY TELLUS ENVIRONMENTAL ASSOCIATES, INC. AND DAVIS ENVIRONMENTAL CONSULTANTS, INC.
9. CONSTRUCTION OF PROPOSED CELL VII AND ANCILLARY FACILITIES IS LIMITED TO THE 68.13 ACRE AREA DEPICTED IN THIS DRAWING.
10. PROPOSED CELL VII AREA MAY BE UTILIZED AS A SOIL STOCKPILE AREA OR POTENTIAL BORROW SOURCE PRIOR TO LANDFILLING.
11. PROPOSED CELL VII IS ANTICIPATED TO TIE INTO CELL V TO FORM ONE CONTIGUOUS LANDFILL CELL.
12. WHERE GROUND WATER EXISTS OR IS EXPECTED TO BE ENCOUNTERED DURING EXCAVATION, A DEWATERING SYSTEM WILL BE INSTALLED TO PREVENT SOFTENING AND DISTURBANCE OF SUBGRADE BELOW FOUNDATIONS AND FILL MATERIAL, TO ALLOW FOUNDATIONS, FILL MATERIAL, AND STRUCTURES/BACKFILL TO BE PLACED IN THE DRY, AND TO MAINTAIN A STABLE EXCAVATION. GROUND WATER SHALL BE MAINTAINED BELOW THE BOTTOM OF ANY EXCAVATION. THE DEWATERING SYSTEM WILL REMAIN IN OPERATION TO PREVENT POSSIBLE BUOYANT UPLIFT FORCE ON STRUCTURES OR FILL MATERIAL AND DISPOSAL OF GROUNDWATER WILL NOT INTERFERE WITH THE CONSTRUCTION OPERATIONS OR DAMAGE EXISTING CONSTRUCTION AS APPROVED BY THE OWNER. INSTALLATION OF GROUND WATER MONITORING POINTS MAY BE NECESSARY TO MAINTAIN THE DEWATERING SYSTEM TO PREVENT A QUICK UPSURGE OF WATER THAT MIGHT WEAKEN THE SUBGRADE.

HDR
HDR Engineering, Inc. of the Carolinas

ISSUE	DATE	DESCRIPTION
A		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
	D.T. DECESARE, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002869.018

SPSA
Regional Landfill
Proposed Cell VII
Part B Application

SUFFOLK VIRGINIA

BASEGRADE PLAN

0 1" 2"

FILENAME	DOC-02.dwg
SCALE	1"=100'

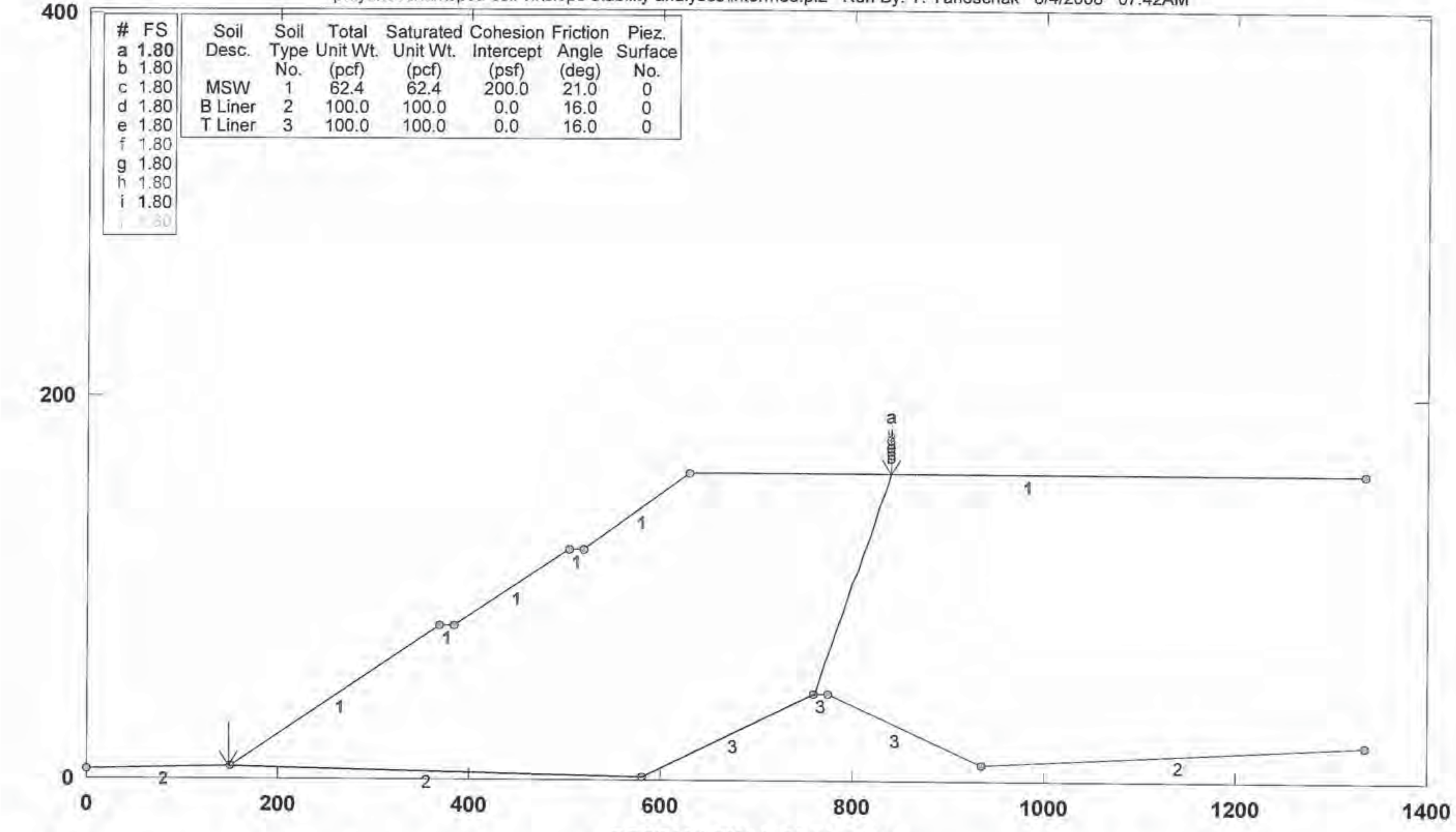
SHEET C-02

C:\PWworking\TPA\dms93507\DOC-02.dwg, Plot, 6/2/2008 10:49:10 AM, gwilliam

ATTACHMENT J

SPSA Cell VII Liner Stability - Intermediate Fill

p:\tyanoschak\spsa cell vii\slope stability analyses\intermed.pl2 Run By: T. Yanoschak 6/4/2008 07:42AM



#	FS
a	1.80
b	1.80
c	1.80
d	1.80
e	1.80
f	1.80
g	1.80
h	1.80
i	1.80
j	1.80

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	0
B Liner	2	100.0	100.0	0.0	16.0	0
T Liner	3	100.0	100.0	0.0	16.0	0

PCSTABL5M/si FSmin=1.80

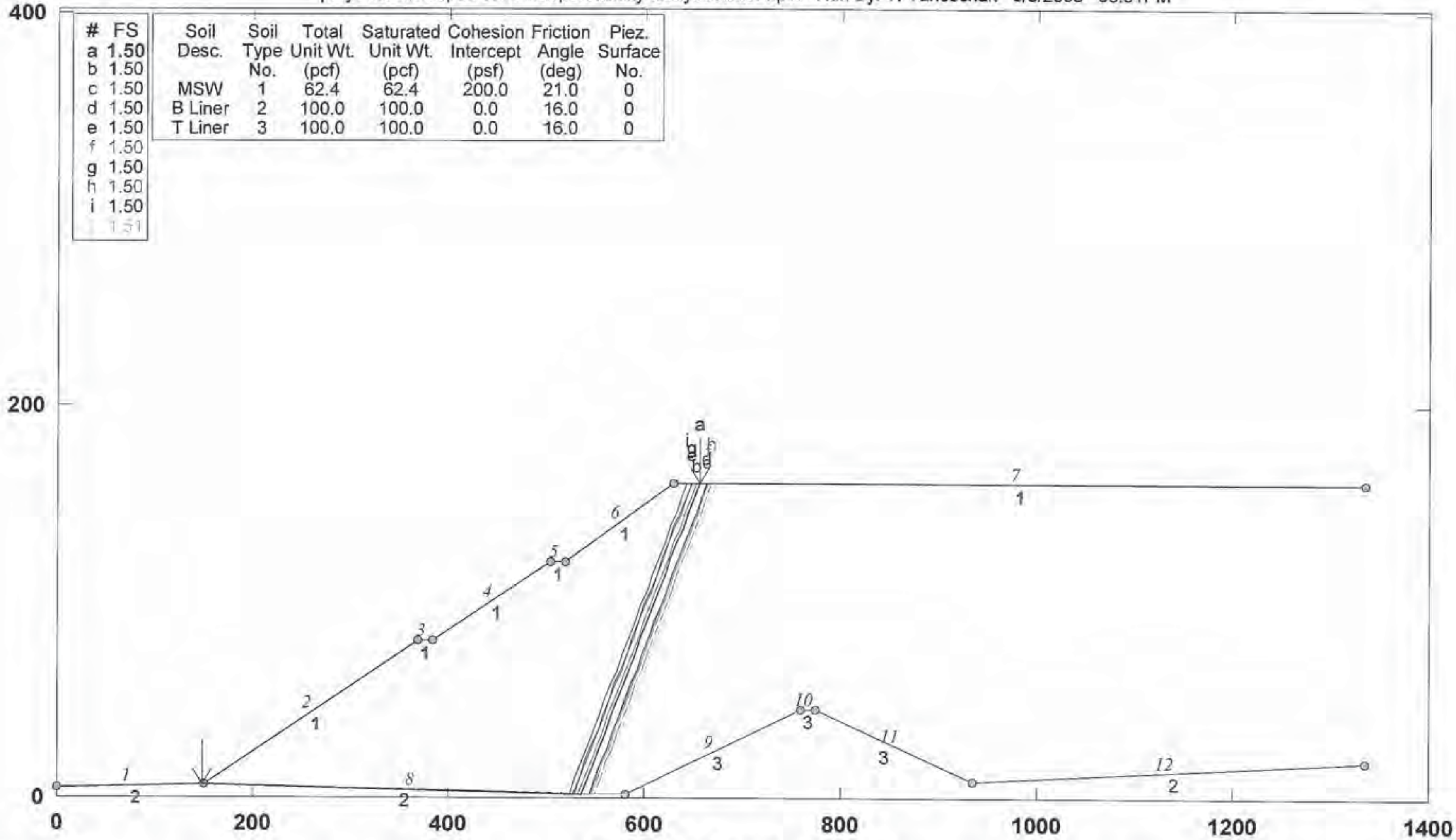
Safety Factors Are Calculated By The Modified Janbu Method for the case of c & phi both > 0

STED

ATTACHMENT K

SPSA Cell VII Liner Stability - Intermediate Fill

p:\tyanoschak\spsa cell vii\slope stability analyses\inter4.pl2 Run By: T. Yanoschak 6/3/2008 05:51PM



#	FS
a	1.50
b	1.50
c	1.50
d	1.50
e	1.50
f	1.50
g	1.50
h	1.50
i	1.50
j	1.51

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	0
B Liner	2	100.0	100.0	0.0	16.0	0
T Liner	3	100.0	100.0	0.0	16.0	0

PCSTABL5M/si FSmin=1.50

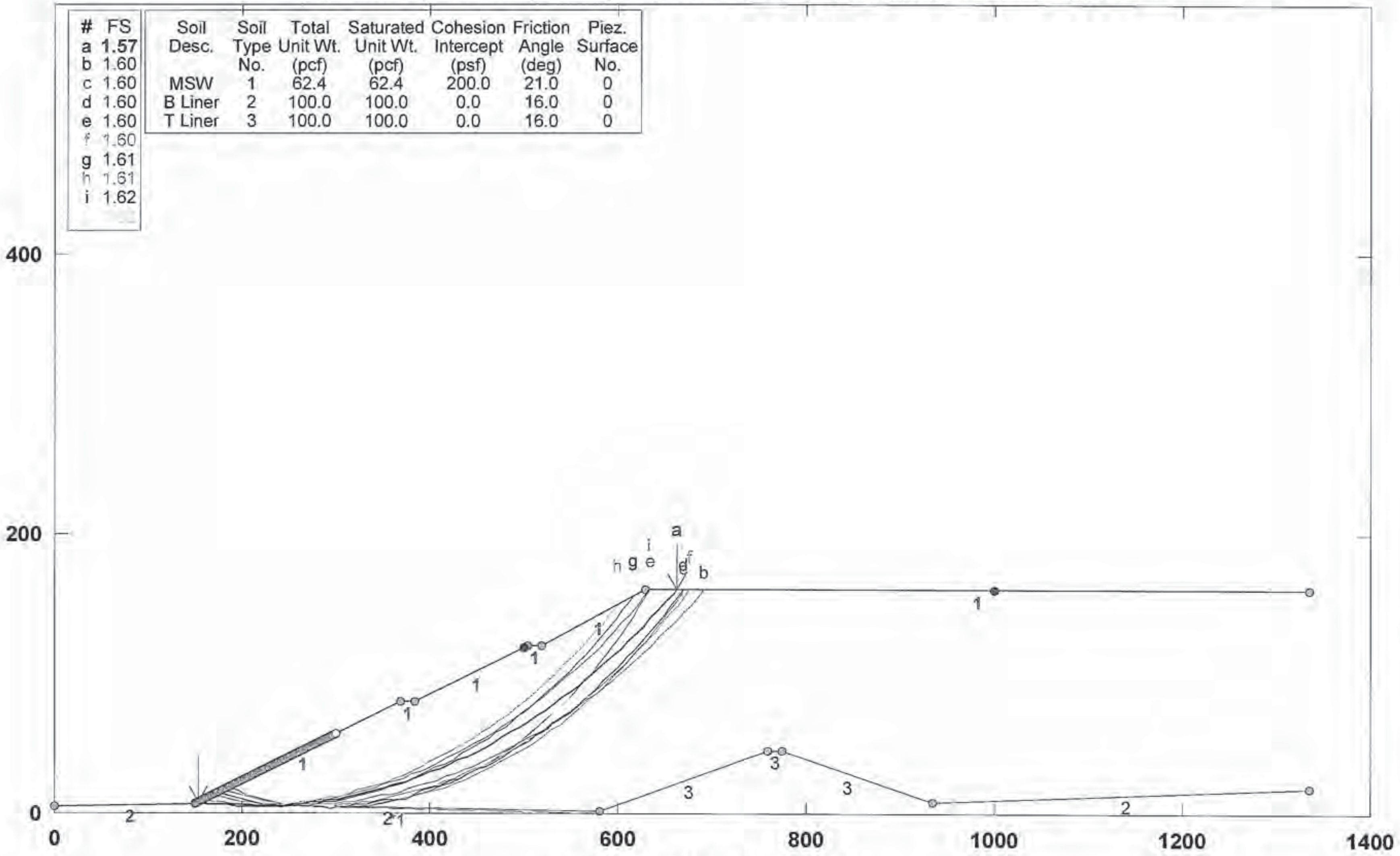
Safety Factors Are Calculated By The Modified Janbu Method for the case of c & phi both > 0

STED

ATTACHMENT L

SPSA Cell VII Waste Stability - Intermediate Fill

p:\tyanoschak\spsa cell vii\slope stability analyses\inter5.pl2 Run By: T. Yanoschak 6/6/2008 03:39PM



#	FS
a	1.57
b	1.60
c	1.60
d	1.60
e	1.60
f	1.60
g	1.61
h	1.61
i	1.62

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	0
B Liner	2	100.0	100.0	0.0	16.0	0
T Liner	3	100.0	100.0	0.0	16.0	0

PCSTABL5M/si FSmin=1.57
Safety Factors Are Calculated By The Modified Bishop Method

STED

ATTACHMENT M

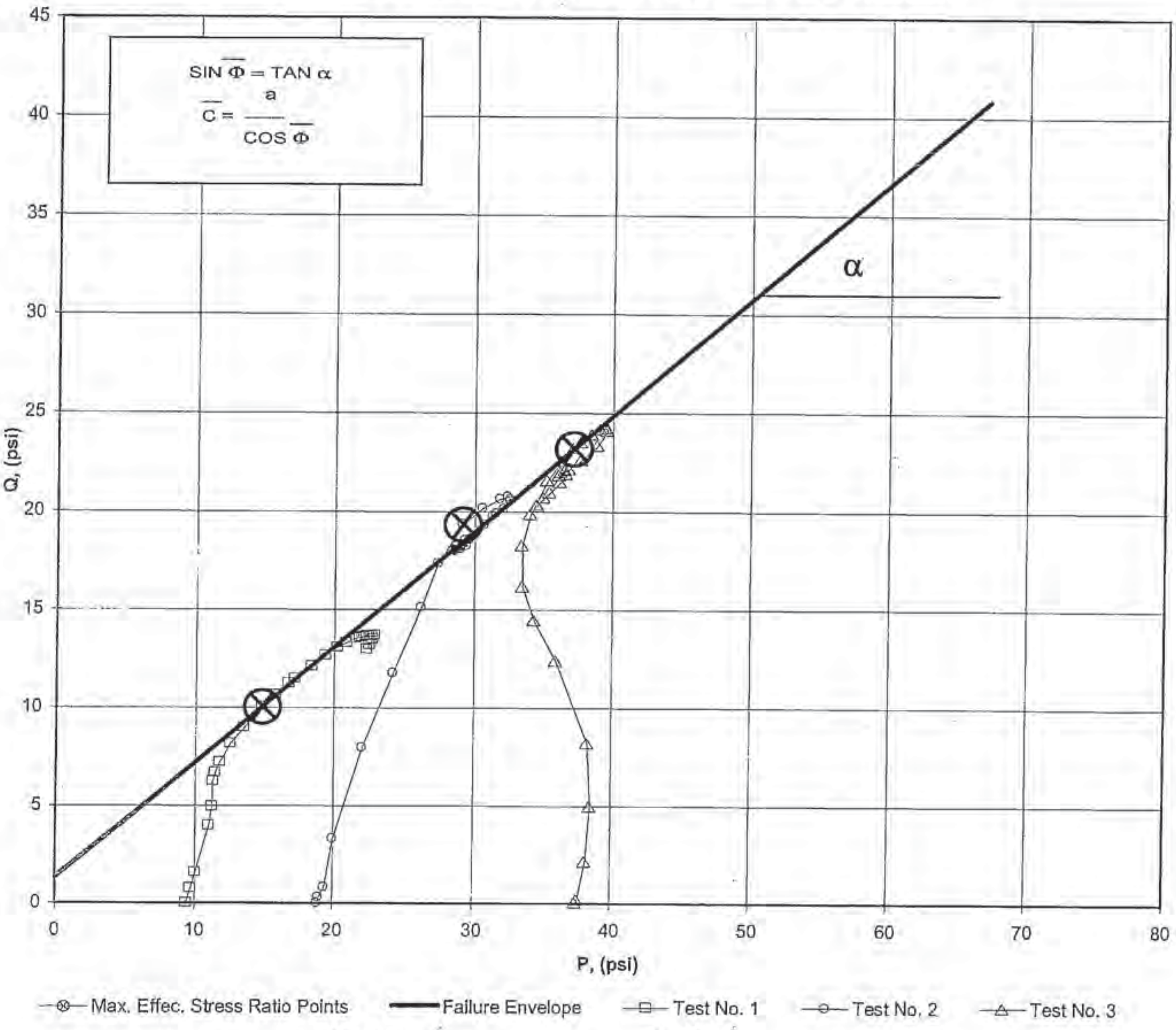
geotechnics
INTEGRITY IN TESTING

CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS

ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	HDR RALEIGH	Boring No.	OW-2
Client Reference	SPSA	Depth(ft.)	34.1-35.7
Project No.	2008-592-01	Sample No.	3
Lab ID	2008-592-01-03		

Consolidated Undrained Triaxial Test with Pore Pressure



	Undrained		Drained
a =	1.32 (190 psf)	$\overline{C}$ =	1.63 (235 psf)
α =	30.5	$\overline{\Phi}$ =	36.04

Tested By TMS Date 6/24/08 Approved By Date 7-7-08

ATTACHMENT N

geotechnics
INTEGRITY IN TESTING

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

ASTM D - 4767 (SOP-S28)

Client	HDR RALEIGH		
Client Reference	SPSA		
Project No.	2008-592-01		
Lab ID	2008-592-01-03	Specific Gravity (assumed)	2.70

Visual Description: GRAY SILTY SAND (UNDISTURBED)

SAMPLE CONDITION SUMMARY

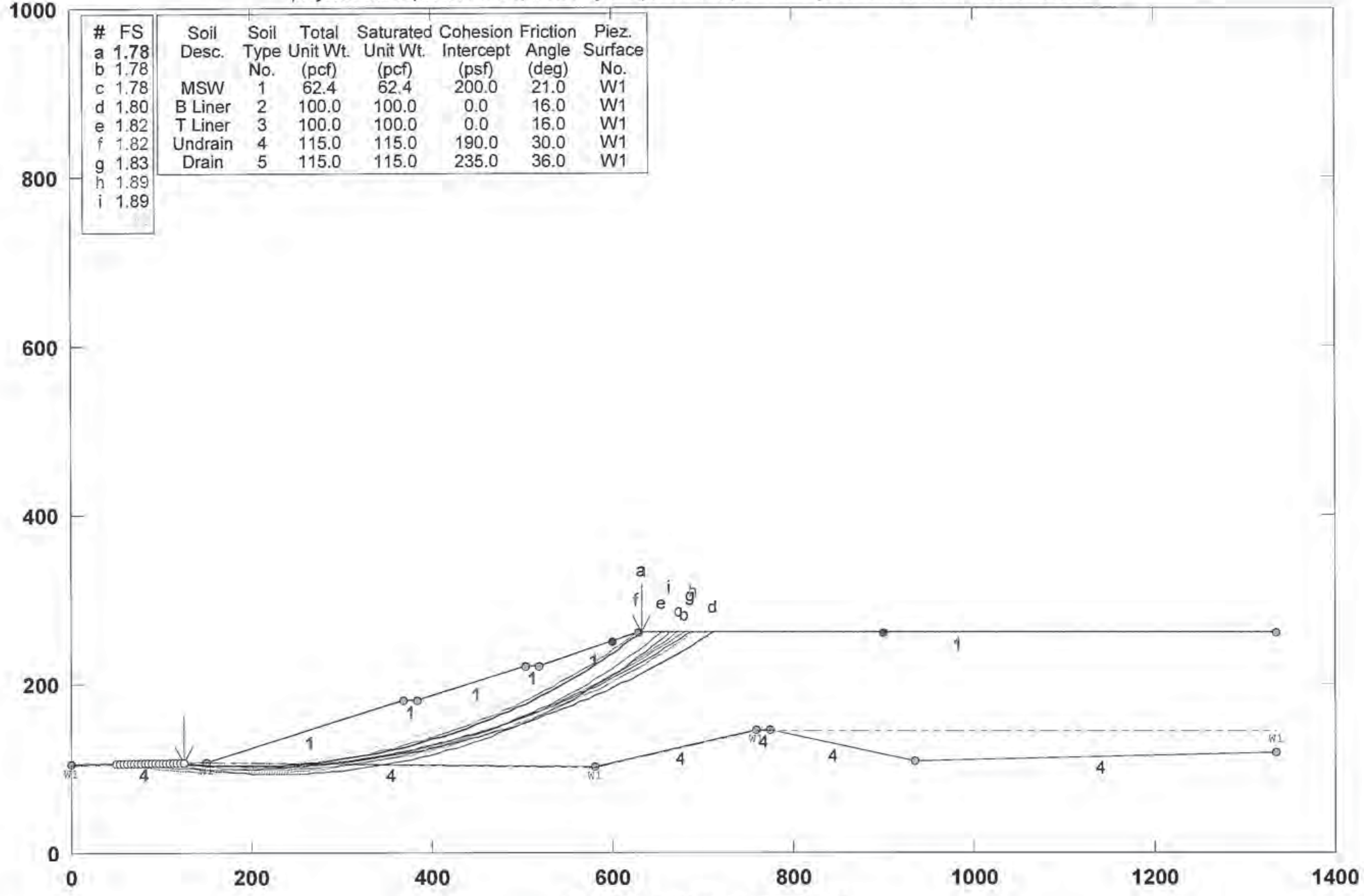
Boring No.	OW-3	OW-3	OW-3
Depth (ft)	34.7-35.2	34.1-34.6	35.2-35.7
Sample No.	3	3	3
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.005	0.005	0.005
Back Pressure (psi)	40	39.9	50
Consolidation Time (days)	1	1	1
Initial State (w%)	34.0	34.0	37.1
Total Unit Weight (pcf)	111.6	115.5	114.9
Dry Unit Weight (pcf)	83.3	86.2	83.8
Final State (w%)	34.7	33.9	33.1
Initial State Void Ratio,e	1.024	0.955	1.012

Tested By TMS Date 6/24/08 Input Checked By MMS Date 7-7-08

ATTACHMENT D

SPSA Cell VII Bearing Capacity (UD) - Int. Fill

p:\tyanoschak\spsa cell vii\slope stability analyses\inter6.pl2 Run By: T. Yanoschak 7/8/2008 05:25PM



#	FS
a	1.78
b	1.78
c	1.78
d	1.80
e	1.82
f	1.82
g	1.83
h	1.89
i	1.89

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W1
B Liner	2	100.0	100.0	0.0	16.0	W1
T Liner	3	100.0	100.0	0.0	16.0	W1
Undrain	4	115.0	115.0	190.0	30.0	W1
Drain	5	115.0	115.0	235.0	36.0	W1

PCSTABL5M/si FSmin=1.78

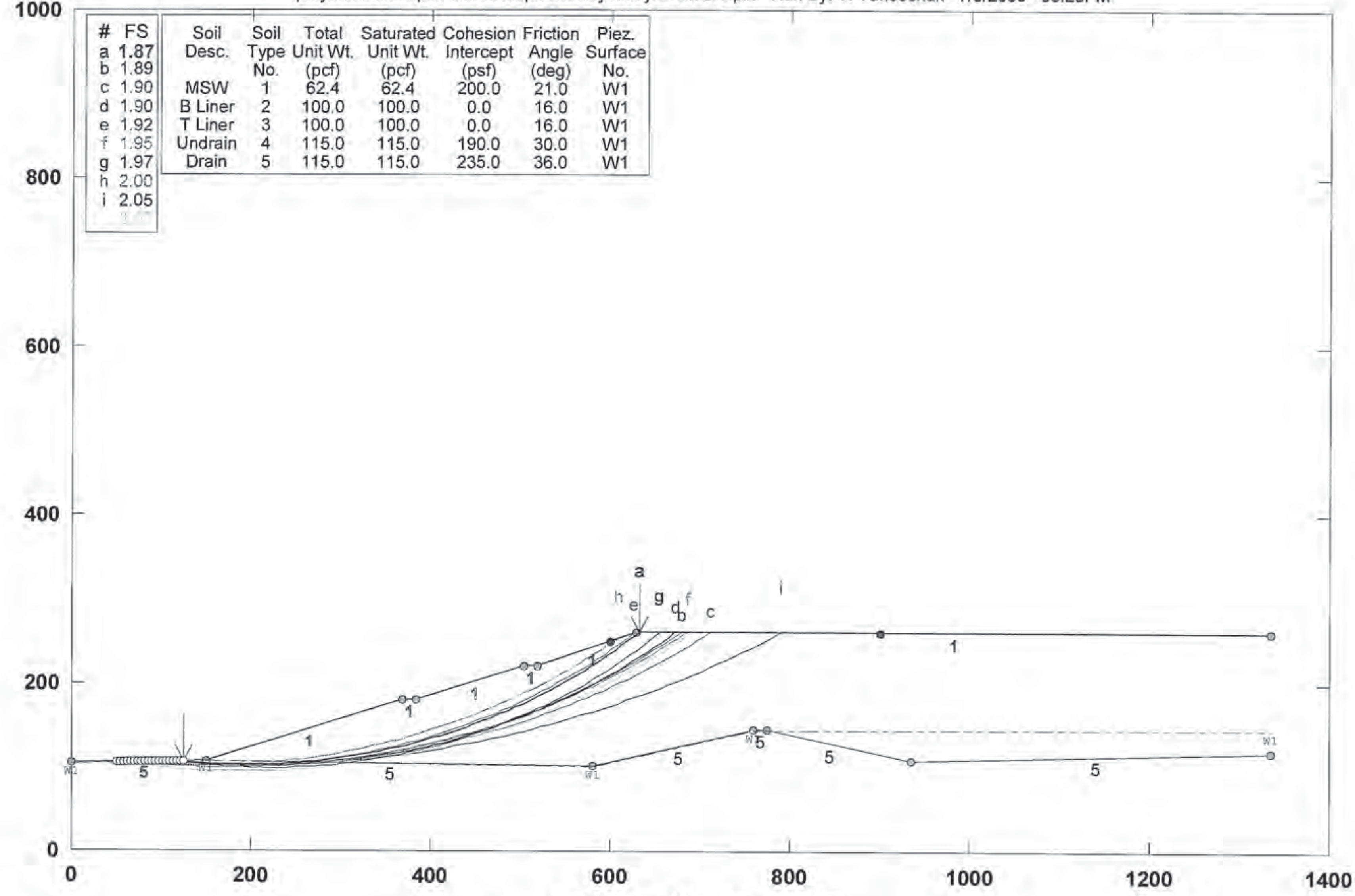
Safety Factors Are Calculated By The Modified Bishop Method

STED

ATTACHMENT 8

SPSA Cell VII Bearing Capacity (D) - Int. Fill

p:\tyanoschak\spsa cell vii\slope stability analyses\inter7.pl2 Run By: T. Yanoschak 7/8/2008 05:28PM



#	FS
a	1.87
b	1.89
c	1.90
d	1.90
e	1.92
f	1.95
g	1.97
h	2.00
i	2.05

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W1
B Liner	2	100.0	100.0	0.0	16.0	W1
T Liner	3	100.0	100.0	0.0	16.0	W1
Undrain	4	115.0	115.0	190.0	30.0	W1
Drain	5	115.0	115.0	235.0	36.0	W1

PCSTABL5M/si FSmin=1.87

Safety Factors Are Calculated By The Modified Bishop Method

STED

GLOBAL STABILITY

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HDR | ONE COMPANY *Many Solutions℠*

Project: SPSA	Computed:	Date: 8/20/08
Subject: Cell VII Part B	Checked: DTD	Date: 8/27/08
Task: Global Stability	Page: 1	of: 2
Job #: 00018-2889-011	No:	

PURPOSE: Evaluate Cell VII Global Stability for Cell filled to maximum capacity. Evaluate for circular arc failure surfaces and sliding along the geosynthetic interfaces.

PROCEDURE:

1. Select strength parameters for MSW:

   Based on information provided in Intermediate Stability Analyses, use Ø = 21°, c = 200 psf (9.6 kn/m^2).

2. Select critical cross-section for analysis:

   By inspection, the critical section for Cell VII at full build-out will be at the northwest corner of Cell VII where the height of fill will be the greatest and ground elevations outside of the landfill will be the lowest (See Att. A & B). These combine to maximize driving forces and minimize resisting forces which results in the lowest anticipated factor of safety.

3. Select soil profile and strength parameters for analysis:

   Use same soil profile and parameters developed for excavated sideslope stability analysis.

4. Estimate Potentiometric Surfaces:

   Assume that at full buildout, the groundwater pumps are turned off and the potentiometric surface acting on the soil layers and liner system is approximately the existing groundwater table at the site. Assume leachate pumps are on and therefore potentiometric surface acting on the waste is max. 1' above the liner system.

5. Evaluate Global Stability (Drained and Undrained Circular Arc Analyses).

Based on STABL5M Analyses:

File Name

(GS1) Drained Analysis (Att. C) min FS = 1.71 } Both > 1.5
(GS2) Undrained Analysis (Att. D) Min FS = 1.67 } ok

6. Evaluate Sliding Block Analysis on Geosynthetic Interface:

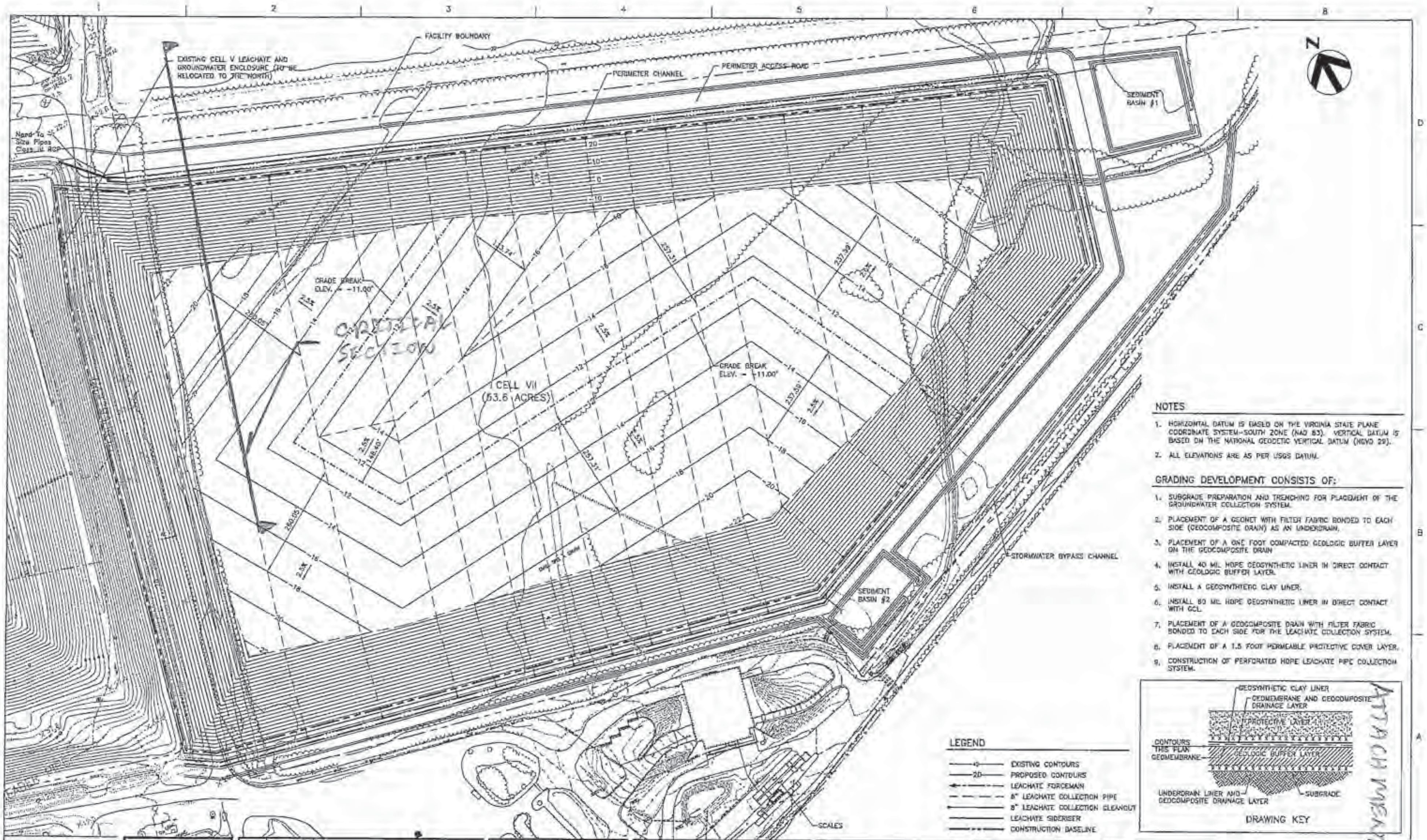
Repeatedly run STABL5M Analysis while adjusting minimum liner system friction angle, Ø, to determine Ø reqd to obtain minimum factor of safety > 1.5.

From Att. E, for Ø liner = 21°, FS = 1.53 (File Name GS3)

CONCLUSION:

The circular arc global stability analyses for both drained and undrained soil conditions yield acceptable factors of safety > 1.5.

The sliding block along geosynthetic interface analysis indicates a minimum interface friction angle, Ø, of 21° is required to maintain a minimum factor of safety = 1.5. Make sure specs show a minimum Ø = 21° for geosynthetics.



NOTES

1. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
2. ALL ELEVATIONS ARE AS PER USGS DATUM.

GRADING DEVELOPMENT CONSISTS OF:

1. SUBGRADE PREPARATION AND TRENCHING FOR PLACEMENT OF THE GROUNDWATER COLLECTION SYSTEM.
2. PLACEMENT OF A GEONET WITH FILTER FABRIC BONDED TO EACH SIDE (GEOCOMPOSITE DRAIN) AS AN UNDERDRAIN.
3. PLACEMENT OF A ONE FOOT COMPACTED GEOLOGIC BUFFER LAYER ON THE GEOCOMPOSITE DRAIN
4. INSTALL 40 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GEOLOGIC BUFFER LAYER.
5. INSTALL A GEOSYNTHETIC CLAY LINER.
6. INSTALL 60 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GCL.
7. PLACEMENT OF A GEOCOMPOSITE DRAIN WITH FILTER FABRIC BONDED TO EACH SIDE FOR THE LEACHATE COLLECTION SYSTEM.
8. PLACEMENT OF A 1.5 FOOT PERMEABLE PROTECTIVE COVER LAYER.
9. CONSTRUCTION OF PERFORATED HDPE LEACHATE PIPE COLLECTION SYSTEM.

LEGEND

—40—	EXISTING CONTOURS
—20—	PROPOSED CONTOURS
←- - — - -	LEACHATE FORCEMAIN
— — — —	8" LEACHATE COLLECTION PIPE
•————	8" LEACHATE COLLECTION CLEANOUT
————	LEACHATE SIDERISER
——•••——	CONSTRUCTION BASELINE

HDR
HDR Engineering, Inc. of the Carolinas

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002888.018

SPSA
Regional Landfill
Cell VII Expansion
Part B Application
SUFFOLK VIRGINIA

MODIFICATIONS PLAN

ATTACHMENT A

0 1" 2"

FILENAME	00C-03.dwg
SCALE	1"=200'

SHEET C-03

C:\pwworking\tpa\dms93507\00C-03.DWG, Plot, 7/29/2008 8:25:47 AM, lpatters

ATTACHMENT B

NOTES

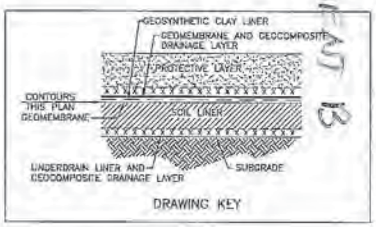
1. EXISTING TOPOGRAPHY SUPPLIED BY HURT AND PROFFIT, INC. FROM AERIAL PHOTOGRAPHY DATED JANUARY 1, 2004.
2. ALL ELEVATIONS ARE AS PER USGS DATUM.
3. LEACHATE COLLECTION PIPES ARE SPACED FOR POTENTIAL LEACHATE RECIRCULATION.
4. THE LEACHATE COLLECTION SYSTEM IS SHOWN FOR CELL VI, WHICH WILL BE CONSTRUCTED IN TWO PHASES.
5. ALL COLLECTION (8") AND HEADER (10") LEACHATE PIPING INSIDE THE CELL WILL BE HDPE (SDR 11) PIPE.

GRADING DEVELOPMENT CONSISTS OF:

1. SUBGRADE PREPARATION AND TRENCHING FOR PLACEMENT OF THE GROUNDWATER COLLECTION SYSTEM.
2. PLACEMENT OF A GEONET WITH FILTER FABRIC BONDED TO EACH SIDE (GEOCOMPOSITE DRAIN) AS AN UNDERDRAIN.
3. PLACEMENT OF A ONE FOOT LOW PERMEABILITY COMPACTED SOIL LINER ON THE GEOCOMPOSITE DRAIN ($K<1x10^{-5}$CM/SEC)
4. INSTALL 40 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH SOIL LINER.
5. INSTALL A GEOSYNTHETIC CLAY LINER.
6. INSTALL 60 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GCL.
7. PLACEMENT OF A GEOCOMPOSITE DRAIN WITH FILTER FABRIC BONDED TO EACH SIDE FOR THE LEACHATE COLLECTION SYSTEM.
8. PLACEMENT OF A 1.5 FOOT PERMEABLE PROTECTIVE COVER LAYER.
9. CONSTRUCTION OF PERFORATED HDPE LEACHATE PIPE COLLECTION SYSTEM.

LEGEND

EXISTING CONTOURS
—20— PROPOSED CONTOURS
LEACHATE FORCEMAIN
LEACHATE COLLECTION PIPE
LEACHATE COLLECTION CLEANOUT
LEACHATE SIDERISER
CONSTRUCTION BASELINE
FACILITY BOUNDARY
SILT FENCE



DRAWING KEY

HDR
HDR Engineering, Inc. of the Carolinas
128 S Tryon Street, Suite 1400 | Charlotte, NC 28202

ISSUE	DATE	DESCRIPTION
		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
	D.T. DECESARE, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA
Regional Landfill
Proposed Cell VII
Part B Application
SUFFOLK VIRGINIA

FINAL GRADING PLAN

0 1" 2"

FILENAME	00C-09.dwg
SCALE	1"=200'

SHEET
C-09

C:\PWworking\TPA\dms93507\00C-09.DWG, Plot, 6/2/2008 10:50:19 AM, gwilliam

ATTACHMENT C

SPSA Cell VII Global Stability Undrained Analysis

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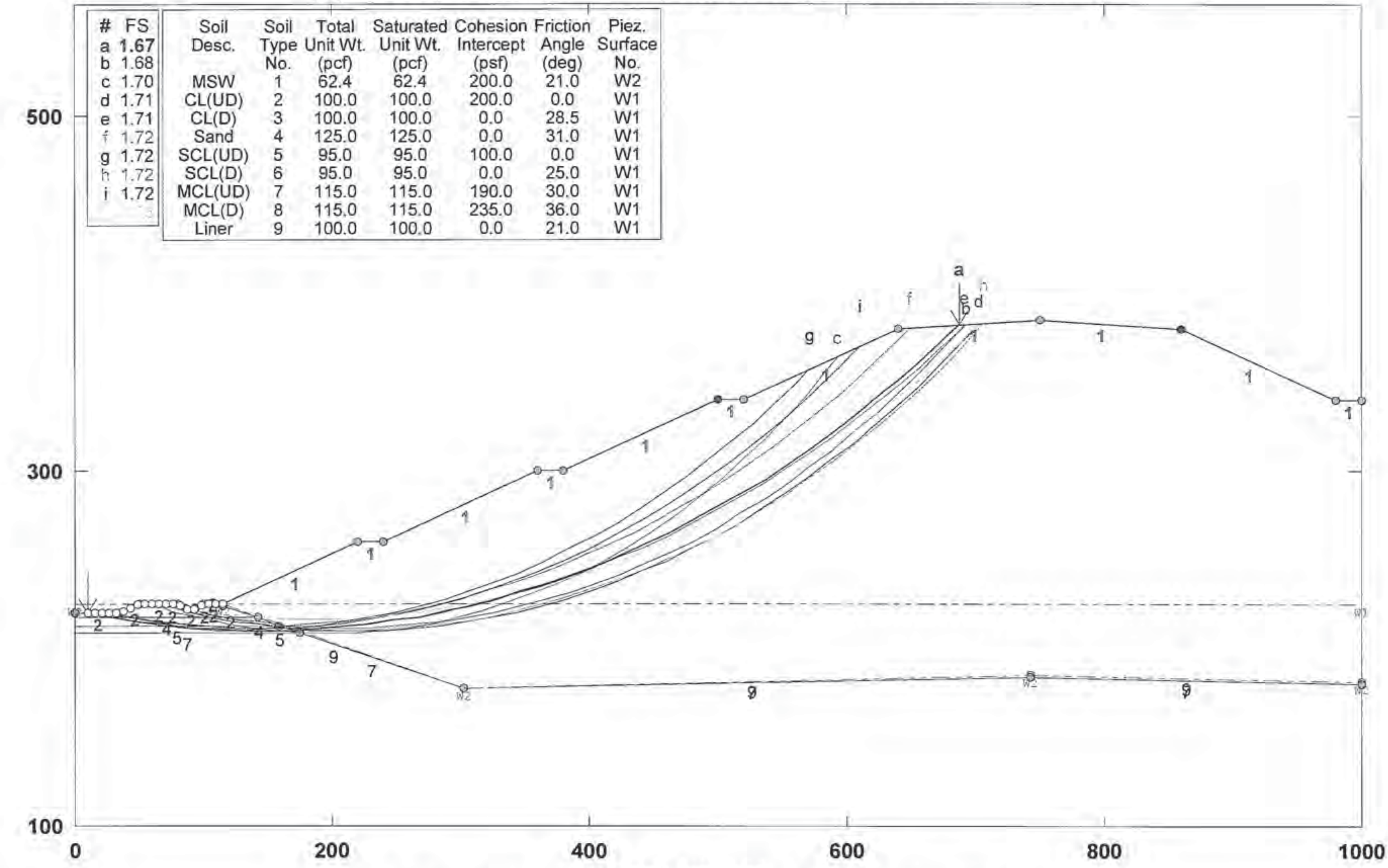


#	FS
a	1.67
b	1.68
c	1.70
d	1.71
e	1.71
f	1.72
g	1.72
h	1.72
i	1.72

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W2
CL(UD)	2	100.0	100.0	200.0	0.0	W1
CL(D)	3	100.0	100.0	0.0	28.5	W1
Sand	4	125.0	125.0	0.0	31.0	W1
SCL(UD)	5	95.0	95.0	100.0	0.0	W1
SCL(D)	6	95.0	95.0	0.0	25.0	W1
MCL(UD)	7	115.0	115.0	190.0	30.0	W1
MCL(D)	8	115.0	115.0	235.0	36.0	W1
Liner	9	100.0	100.0	0.0	21.0	W1

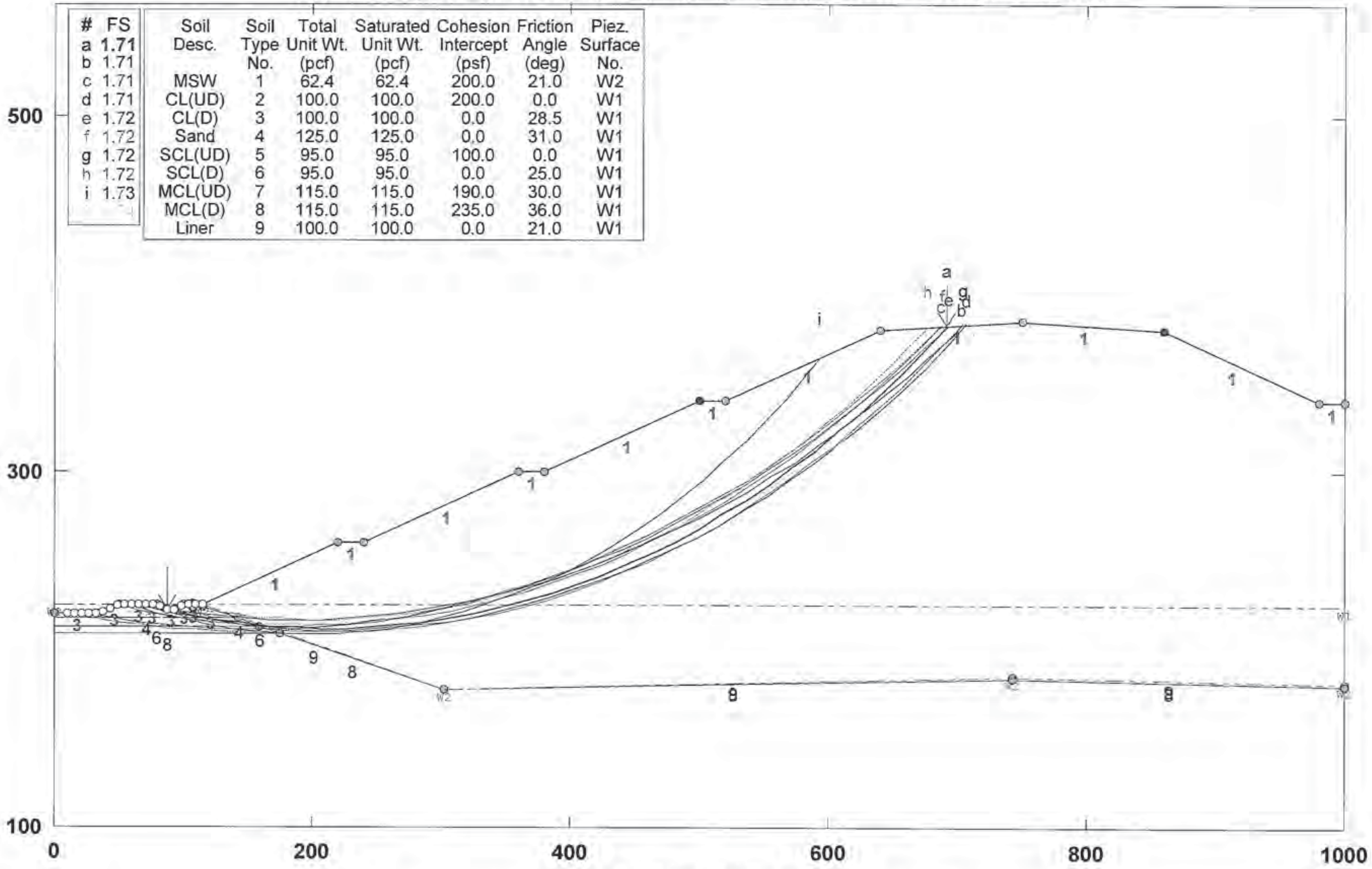
PCSTABL5M/si FSmin=1.67
Safety Factors Are Calculated By The Modified Bishop Method

STED

ATTACHMENT D

SPSA Cell VII Global Stability Drained Analysis

p:\tyanoschak\spsa cell vii\slope stability analyses\gs2.pl2 Run By: T. Yanoschak 8/20/2008 11:22AM



#	FS
a	**1.71**
b	1.71
c	1.71
d	1.71
e	1.72
f	1.72
g	1.72
h	1.72
i	1.73

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W2
CL(UD)	2	100.0	100.0	200.0	0.0	W1
CL(D)	3	100.0	100.0	0.0	28.5	W1
Sand	4	125.0	125.0	0.0	31.0	W1
SCL(UD)	5	95.0	95.0	100.0	0.0	W1
SCL(D)	6	95.0	95.0	0.0	25.0	W1
MCL(UD)	7	115.0	115.0	190.0	30.0	W1
MCL(D)	8	115.0	115.0	235.0	36.0	W1
Liner	9	100.0	100.0	0.0	21.0	W1

PCSTABL5M/si FSmin=1.71

Safety Factors Are Calculated By The Modified Bishop Method

STED

ATTACHMENT E

SPSA Cell VII Global Stability Sliding Block Liner Inteface Analysis

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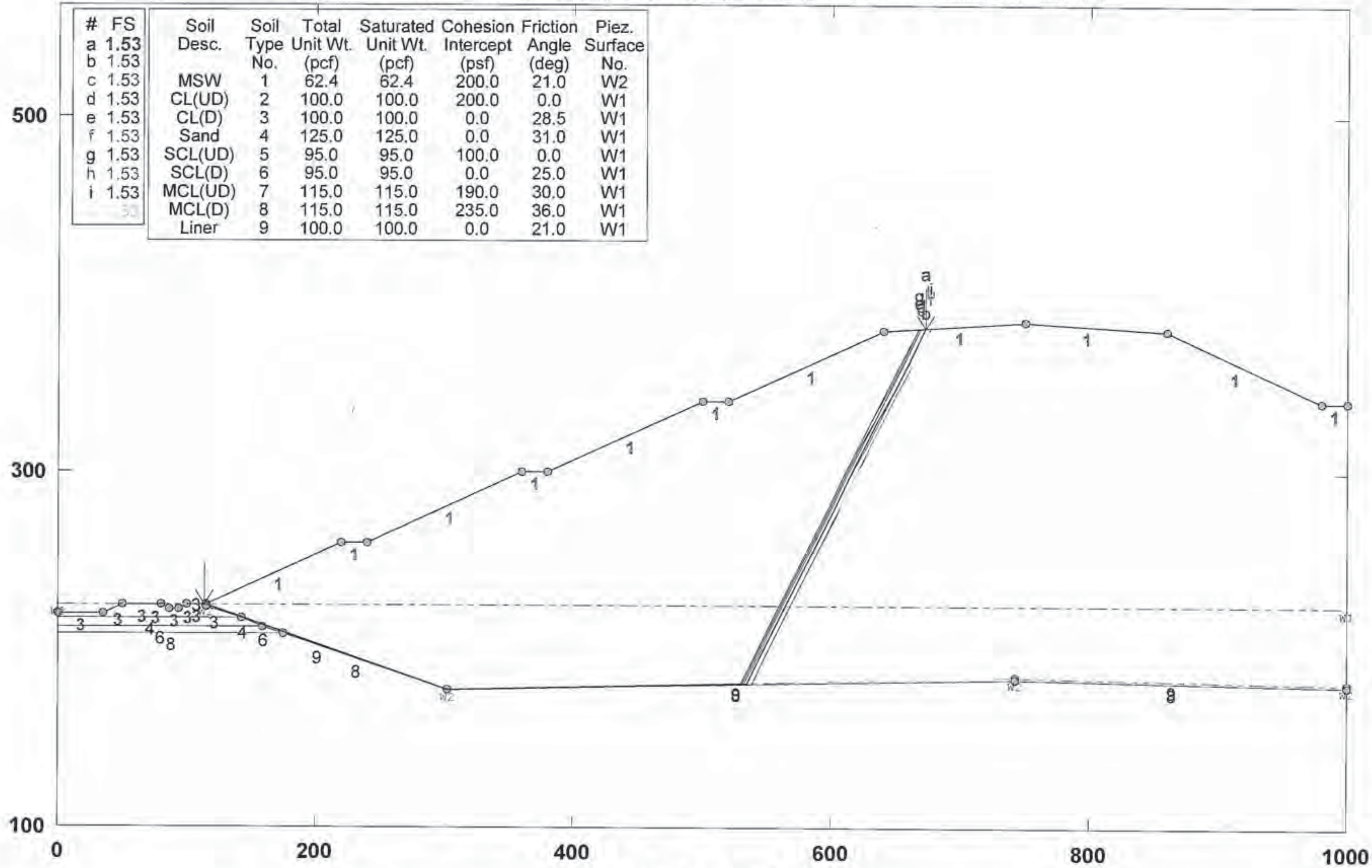

#	FS
a	1.53
b	1.53
c	1.53
d	1.53
e	1.53
f	1.53
g	1.53
h	1.53
i	1.53

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W2
CL(UD)	2	100.0	100.0	200.0	0.0	W1
CL(D)	3	100.0	100.0	0.0	28.5	W1
Sand	4	125.0	125.0	0.0	31.0	W1
SCL(UD)	5	95.0	95.0	100.0	0.0	W1
SCL(D)	6	95.0	95.0	0.0	25.0	W1
MCL(UD)	7	115.0	115.0	190.0	30.0	W1
MCL(D)	8	115.0	115.0	235.0	36.0	W1
Liner	9	100.0	100.0	0.0	21.0	W1

PCSTABL5M/si FSmin=1.53

Safety Factors Are Calculated By The Modified Janbu Method for the case of c & phi both > 0

STED

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SIDESLOPE STABILITY

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Project:	SPSA	Computed:	JMy	Date:	6/27/08
Subject:	Cell VII Part B	Checked:	DTT	Date:	8/27/08
Task:	Excavated Sideslope Stability	Page:	1	of:	4
Job #:	00018-2889-011	No:			

PURPOSE: Evaluate the excavated sideslope of Cell VII prior to placement of waste within Cell VII for slope stability.

PROCEDURE:

1. Select strength parameters for MSW:

Based on information provided in Intermediate Stability analyses, use $\phi = 21^\circ$, $C = 200 psf$ ($9.6 kN/m^2$).

2. Select critical cross-section for analysis:

By inspection, the critical excavated sideslope location will be on the west side of Cell VII where Cell VII will provide surcharge loading of the slope. Review of boring and dilatometer logs within Cell VII show that soils within the western portion of the site generally exhibit less strength. Therefore, select critical cross-section for analysis on west side of Cell VII where height of fill within Cell V will be the highest as shown in Attachment A and B.

3. Select soil profile and strength parameters for analysis:

Use boring and dilatometer logs for location P-1 which is located on west side of Cell VII. Develop the following generalized soil profile:

EL. 30
Clay
EL. 17
Sandy Soils
EL. 13
Soft Clay
EL. 9
Silty/Clayey Sand

Clay Layer:

Undrained shear strength (S_u):

From dilatometer log in Att. C, $S_u = 2$ bars ≈ 400 psf. $C = \frac{1}{2} S_u = \underline{200 \text{ psf}}$
Assume $\underline{\phi = 0}$

Drained shear strength:

From P-1 boring log in Att. D, avg. SPT-N value for clay layer is 5.5 bpf. Use correlation between N and ϕ in Att. E to approximate strength in fully drained conditions.
$\therefore \underline{\phi \approx 28.5^\circ,\ C = 0}$

Unit weight (γ):

Use Att. F with dilatometer log (Att. C) to estimate unit wt.

For clay layer: dilatometer modulus (E_D) ≈ 20 bars
material index (I_D) ≈ 0.2
$\therefore$ From Att. F, $\gamma / \gamma_w = 1.6$
Assuming $\gamma_w = 62.4$ lb/ft^3, $\gamma = 1.6(62.4) \approx \underline{100 \text{ lb/ft}^3}$

Sandy Soils: Since soils are free draining, only drained strength parameters are appropriate.

From Att. C, $\underline{\phi = 31^\circ}$, Assume $\underline{C = 0}$

Unit weight (γ):

From Att. C, $E_D \approx 400$ bars, $I_D \approx 1.3$
From Att. F, $\gamma / \gamma_w \approx 2.0$
$\therefore \gamma = 2.0\ (62.4 \text{ lb/ft}^3) = \underline{125 \text{ lb/ft}^3}$

Soft Clay:

Undrained shear strength (Su):

Take as 1/2 of uppermost clay layer = $\frac{1}{2}(400\,psf) = 200\,psf$

$C = \frac{1}{2} S_u = \underline{100\,psf,\ \phi = 0}$

Drained shear strength:

From P-1 boring log in Att. D, SPT-N value = 0.

From Att. E, $\underline{\phi = 25^\circ,\ \text{Assume } C = 0}$

Unit Weight (γ):

From Att. F, Assume $\gamma/\gamma_w = 1.5$, $\therefore \gamma = 1.5\,(62.4\,lb/ft^3) = \underline{93.6\ lb/ft^3}$

Say 95 lb/ft3

Silty/Clayey Sands:

Estimate drained and undrained strength parameters for silty/clayey sands using results from consolidated-undrained triaxial test on Cell VII soil sample obtained from a depth of 34.1-35.7 feet (Att. G).

$\therefore$ undrained parameters: $C = 190\,psf$, $\phi = 30^\circ$

$\therefore$ Drained Parameters: $\bar{c} = 235\,psf$, $\bar{\phi} = 36^\circ$

Unit Weight (γ):

Estimate unit weight of Silty/Clayey sands using typical values measured from Shelby tube samples obtained from a depth of 34.1-35.7 feet (Att. H).

$\therefore \gamma = 115\,lb/ft^3$

4. Estimate Potentiometric Surfaces

In Cell VII, Assume potentiometric surface is located 1' below excavation.

In Cell V, conservatively assume groundwater pumps are off and potentiometric surface acting on bottom liner equals natural water table elevation (≈25 ft msl)

5. Inputting these parameters into STABL5M yields analyses shown on Att. G and H's

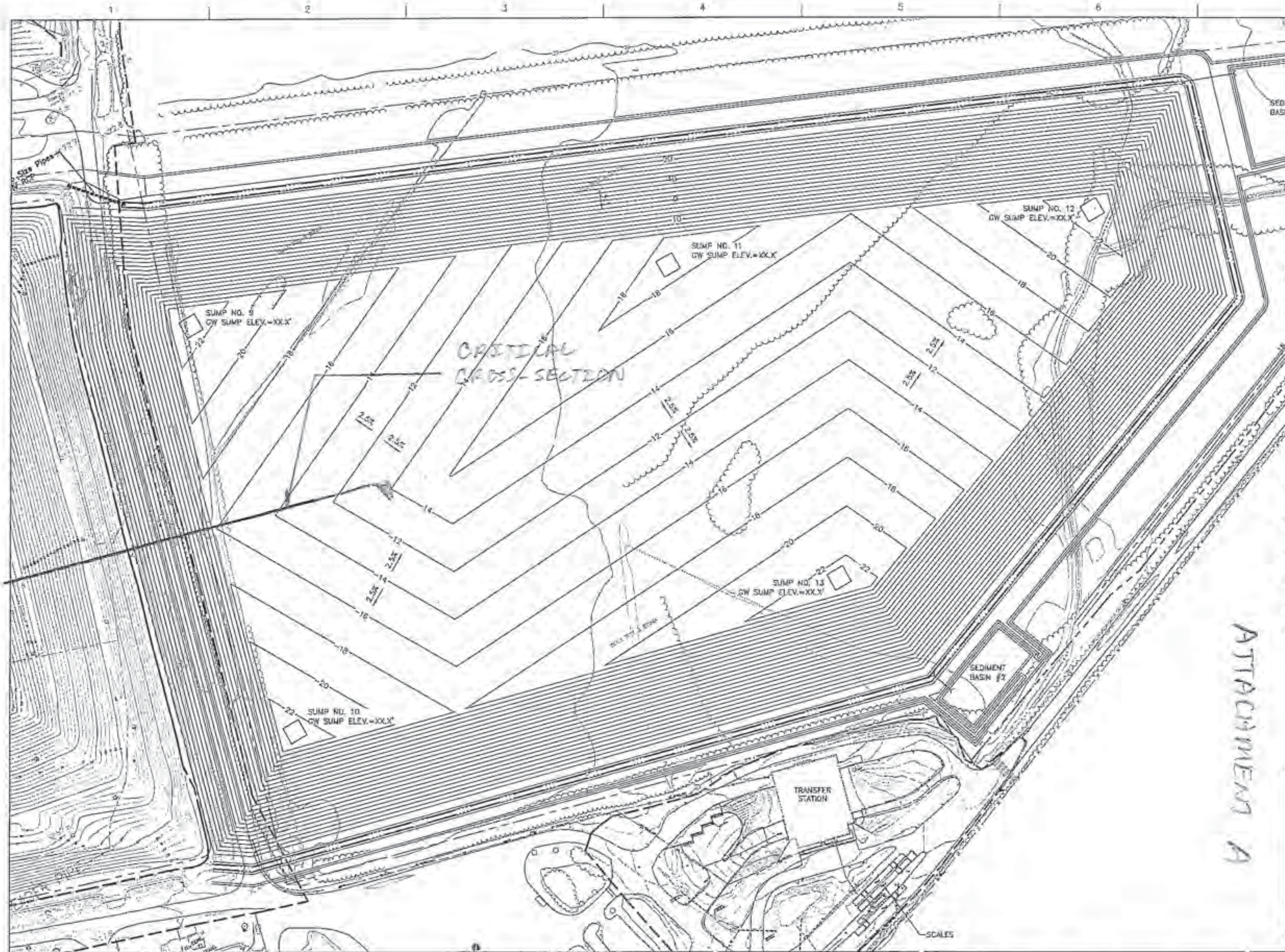
Summary of STABL5M Analysis
(Excavated sideslope Stability)

File Name	Analysis	Min. FS	Att.
EXCSS1	Undrained *	1.56	I
EXCSS2	Drained **	1.69	J

* Undrained parameters applicable for rapid loading conditions before excess pore pressures in soils can dissipate.
** Drained parameters applicable for slow loading conditions where excess pore pressures in soils have time to dissipate.

CONCLUSION:

Anticipated worst-case Cell VII sideslope stability condition is stable with with all analyses yielding a minimum factor of safety above 1.5.



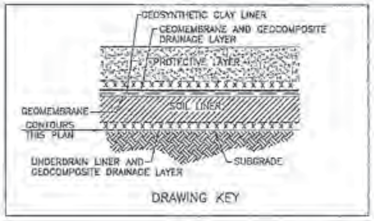
ATTACHMENT A

LEGEND

——o—— EXISTING CONTOURS
——20—— PROPOSED CONTOURS
—— CONSTRUCTION BASELINE

NOTES

1. TOPOGRAPHY WITHIN AREA OF EXPOSED GEOSYNTHETICS ON SOUTH SIDE OF CELLS I-IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED NOVEMBER 6 AND 15, 2007.
2. TOPOGRAPHY WITHIN AREAS OF CELLS I-IV WITH SOIL COVER OVER GEOSYNTHETICS (EXCLUDING EAST SLOPE) SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED MAY 2, 2008.
3. TOPOGRAPHY WITHIN EAST SLOPE OF CELLS I-IV SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM FIELD SURVEY DATED APRIL 1, 2008.
4. EXISTING TOPOGRAPHY WITHIN CELL V AND CELL VI PHASE 1 SUPPLIED BY HOGGARD & EURE ASSOC., PC FROM AERIAL PHOTOGRAPHY DATED DECEMBER 27, 2007.
5. AS-BUILT TOPOGRAPHY WITHIN CELL VI PHASE 2 SUPPLIED BY BATEMAN CIVIL-SURVEY CO., PC FROM FIELD SURVEY DATED NOVEMBER 12, 2007.
6. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
7. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM-SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
8. WETLAND MITIGATION AREAS ARE FROM THE 404 PERMIT MODIFICATION DATED OCTOBER 2000 PREPARED BY TELLUS ENVIRONMENTAL ASSOCIATES, INC. AND DAVIS ENVIRONMENTAL CONSULTANTS, INC.
9. CONSTRUCTION OF PROPOSED CELL VI AND ANCILLARY FACILITIES IS LIMITED TO THE 68.13 ACRE AREA DEPICTED IN THIS DRAWING.
10. PROPOSED CELL VII AREA MAY BE UTILIZED AS A SOIL STOCKPILE AREA OR POTENTIAL BORROW SOURCE PRIOR TO LANDFILLING.
11. PROPOSED CELL VII IS ANTICIPATED TO TIE INTO CELL V TO FORM ONE CONTIGUOUS LANDFILL CELL.
12. WHERE GROUND WATER EXISTS OR IS EXPECTED TO BE ENCOUNTERED DURING EXCAVATION, A DEWATERING SYSTEM WILL BE INSTALLED TO PREVENT SOFTENING AND DISTURBANCE OF SUBGRADE BELOW FOUNDATIONS AND FILL MATERIAL, TO ALLOW FOUNDATIONS, FILL MATERIAL, AND STRUCTURES/BACKFILL TO BE PLACED IN THE DRY, AND TO MAINTAIN A STABLE EXCAVATION. GROUND WATER SHALL BE MAINTAINED BELOW THE BOTTOM OF ANY EXCAVATION. THE DEWATERING SYSTEM WILL REMAIN IN OPERATION TO PREVENT POSSIBLE BUOYANT UPLIFT FORCE ON STRUCTURES OR FILL MATERIAL AND DISPOSAL OF GROUNDWATER WILL NOT INTERFERE WITH THE CONSTRUCTION OPERATIONS OR DAMAGE EXISTING CONSTRUCTION AS APPROVED BY THE OWNER. INSTALLATION OF GROUND WATER MONITORING POINTS MAY BE NECESSARY TO MAINTAIN THE DEWATERING SYSTEM TO PREVENT A QUICK UPSURGE OF WATER THAT MIGHT WEAKEN THE SUBGRADE.



DRAWING KEY

HDR

HDR Engineering, Inc. of the Carolinas

A ISSUED FOR APPROVAL

PROJECT MANAGER J.C. READLING, P.E.
D.T. DECESARE, P.E.
C.M. WILLIAMS, E.I.

SPSA

Regional Landfill
Proposed Cell VII
Part B Application

SUFFOLK VIRGINIA

BASEGRADE PLAN

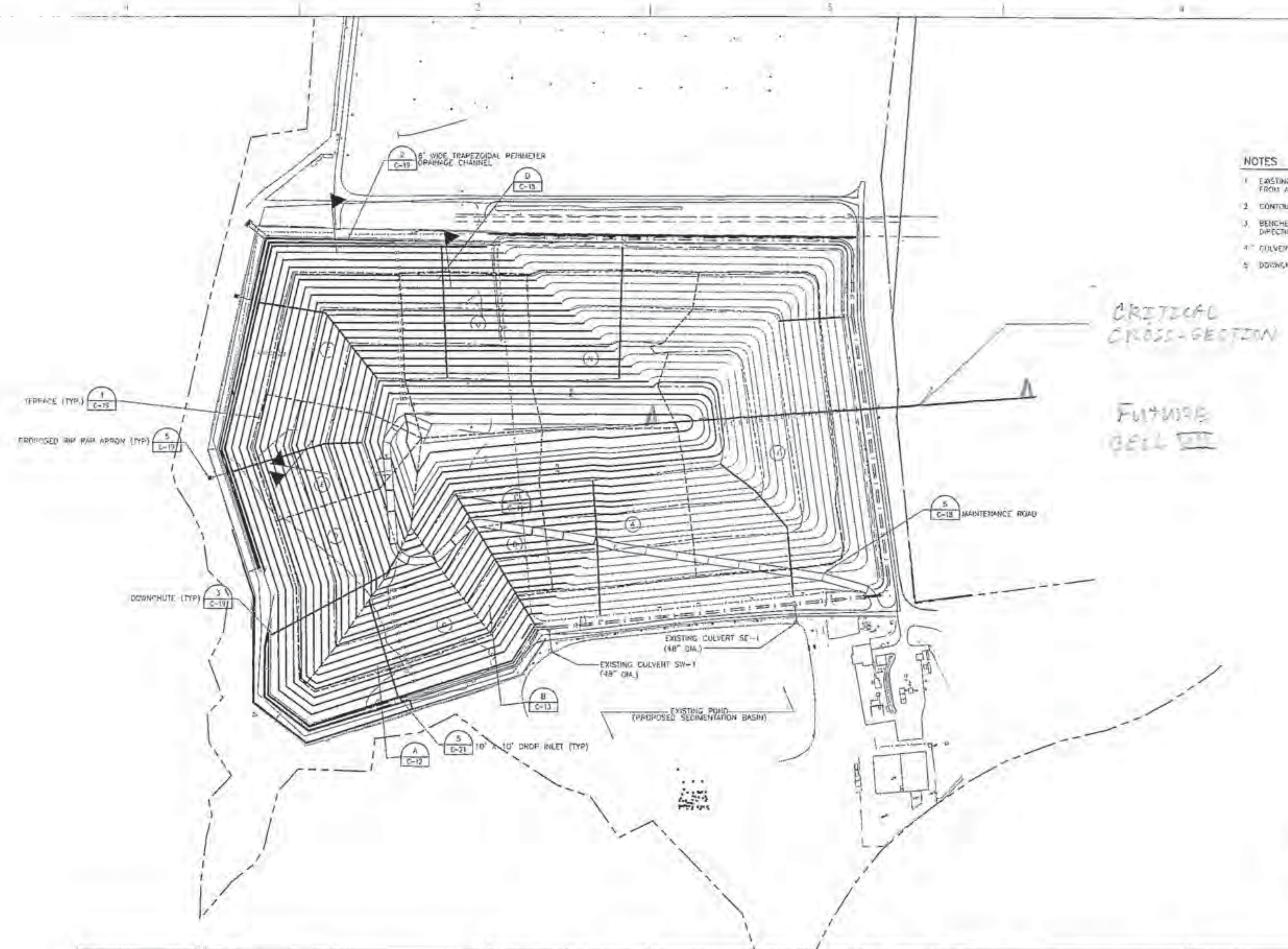
0 1" 2"

FILENAME 00C-02.dwg
SCALE 1"=100'

SHEET C-02

C:\PWworking\TPA\dms93507\00C-02.dwg, Plot, 6/2/2008 10:49:10 AM, gwilliam

ATTACHMENT B



N

300 0 200 400
SCALE IN FEET

NOTES

1. EXISTING TOPOGRAPHY SUPPLIED BY HUNT AND PROFFIT, INC. FROM AERIAL PHOTOGRAPHY DATED JANUARY 1, 2004.
2. CONTOURS DEPICT TOP OF FINAL COVER SYSTEM.
3. BENCHES ARE SHOWN SCHEMATICALLY, INDICATOR ARROW SHOWS DIRECTION OF FLOW.
4. CULVERTS TO BE CORRUGATED METAL OR REINFORCED CONCRETE.
5. DOWNCHUTES TO BE GABION LINED.

LEGEND

═ ═ ═	CHANNEL FLOW
— · — · —	PERIMETER CHANNEL
—►· · · ——	DIVERSION CHANNEL
———	DOWNCHUTE
- - - - -	DRAINAGE DELINEATION
Ⓐ	DRAINAGE AREA

HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION
C	8/5/05	REVISED FINAL ACCESS ROAD
B	4/7/05	REVISED FINAL HEIGHT
A		ISSUED FOR APPROVAL

PROJECT MANAGER	J.C. READLING, P.E.
	D.T. DECESARE, P.E.
	J. CAUL
PROJECT NUMBER	00002889.018

DOUGLAS T. DECESARE
No. 026338
8-5-05

SPSA

Regional Landfill
Cell VI Expansion
PART B APPLICATION

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE

0 1" 2"

FILENAME DOC-07
SCALE 1"=200'

SHEET
C-09

ATTACHMENT C

PROJECT: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia

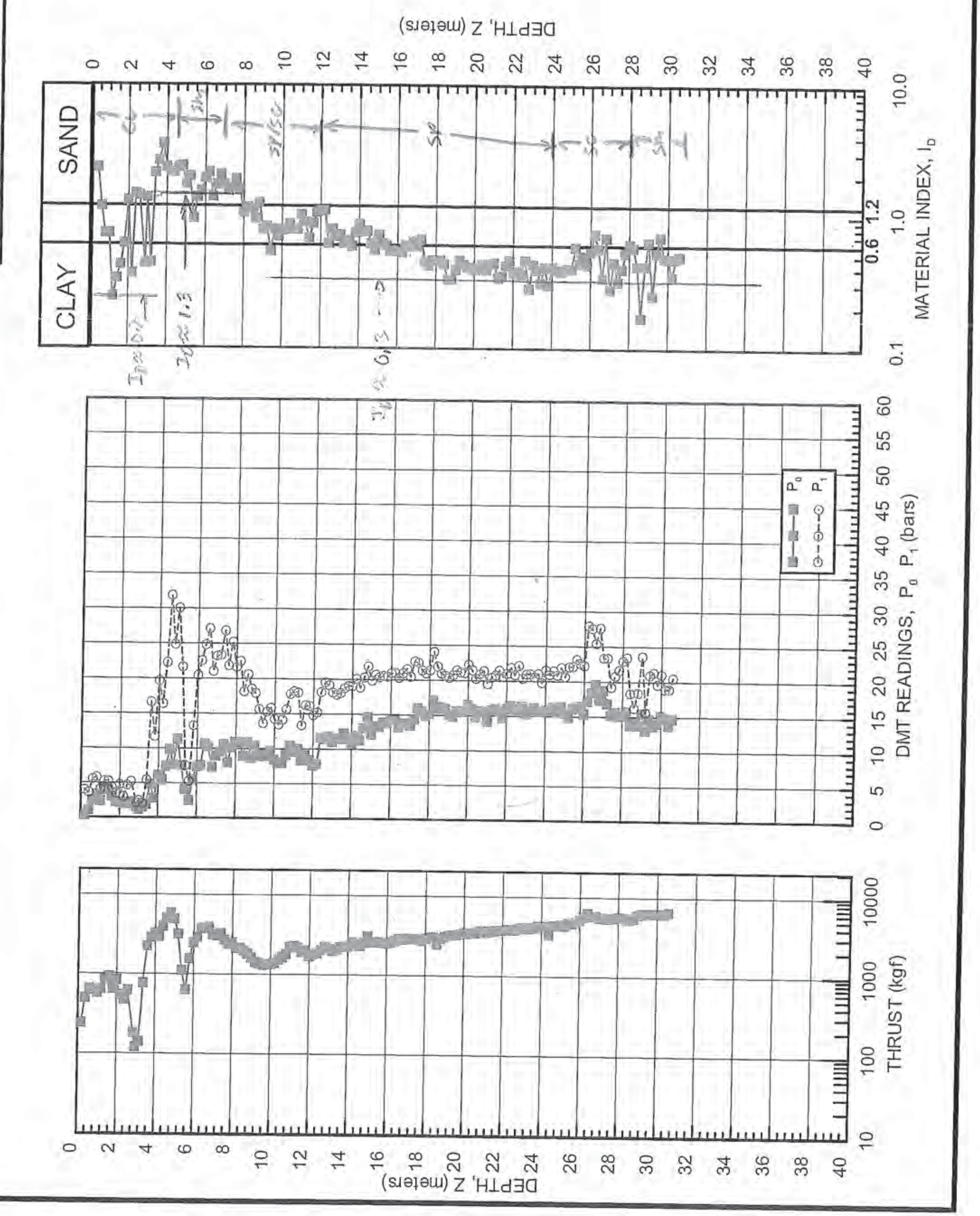
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 5/2/07

SOUNDING

P-1

DILATOMETER RESULTS

Ground Surface Elev.: ~6.5 m
Water Depth: ~0.6 m

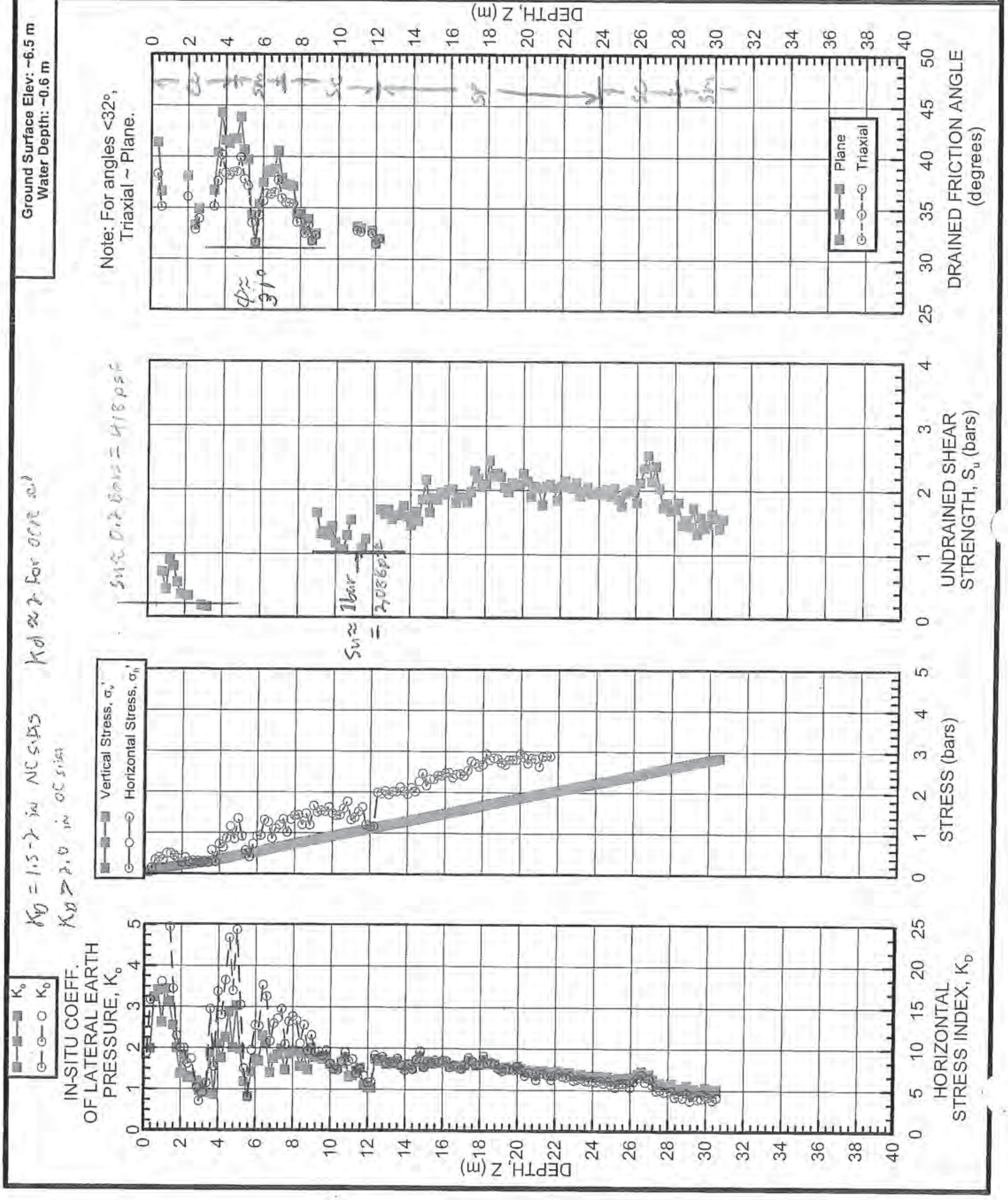


PROJECT: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 5/2/07

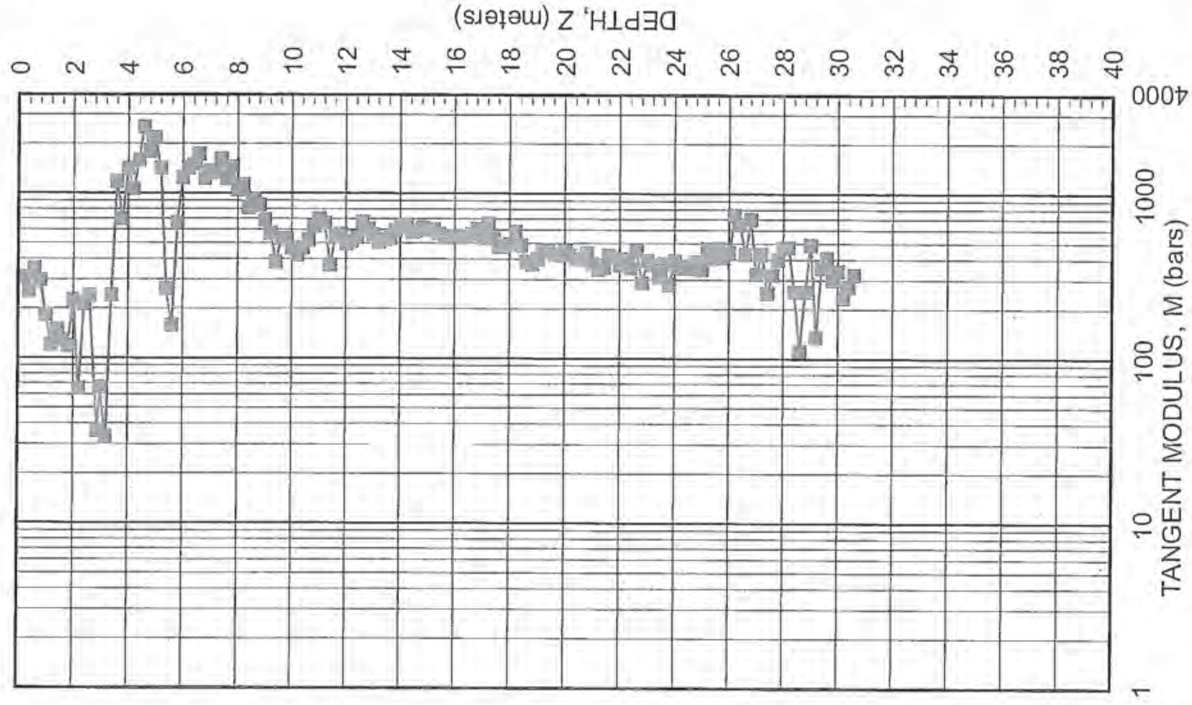
SOUNDING
P-1

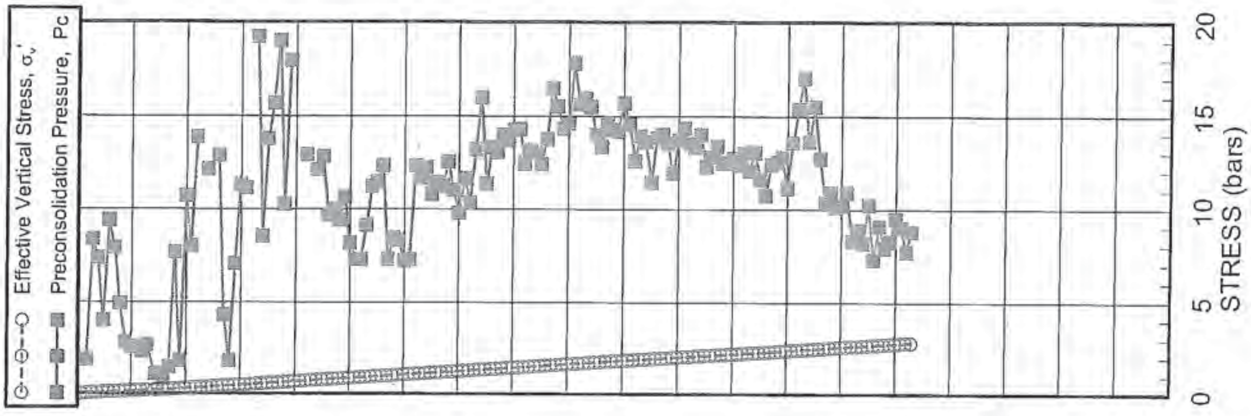
INTERPRETED DMT STRENGTH PARAMETERS

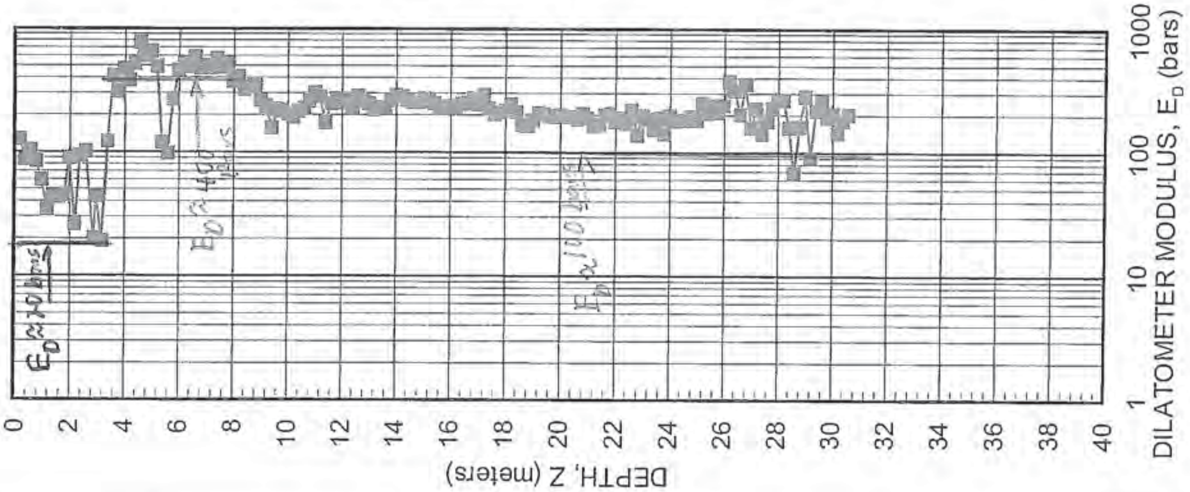


PROJECT: Suffolk Regional Landfill LOCATION: Suffolk, Virginia	IN-SITU SOIL TESTING, L.C. ENGINEER: R. Failmezger SOUNDING DATE: 5/2/07	SOUNDING
INTERPRETED DMT DEFORMATION PARAMETERS		P-1

Ground Surface Elev.: ~6.5 m
Water Depth: ~0.6 m







ATTACHMENT D

LOG OF BORING P- 1

SHEET 1 of 4

HDR
5700 Lake Wright Drive
Suite 300
Norfolk, VA 23502
757.222.1500
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CLIENT: Southeastern Public Service Authority
PROJECT: Cell VII
LOCATION: SPSA Regional Landfill
Suffolk, VA

PROJECT NO. 2889-011-018

DRILLING DETAILS:
Drilled by Fishburn Drilling using CME-75HD and Mud Rotary. Boring completed 4/11/2007.

SURFACE ELEVATION: 21.4
BORING DEPTH (ft): 100.00
PROPOSED SUBGRADE ELEVATION: -22.0

GROUNDWATER DEPTH AT COMPLETION (ft):
GROUNDWATER DEPTH AFTER 24 HRS (ft):

		FIELD DATA			LAB DATA					
						ATTERBERG LIMITS				
ELEVATION (feet)	DEPTH (feet)	BLOW COUNT	PERCENT RECOVERY / R.Q.D.	N-value	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	0	1								Topsoil
	1	2 2		4						Mottled Tan and Yellowish Brown Medium Sandy CLAY (CL) with roots
20										
	2	2								
	3	2 3				Avg. N = 5.5				Wet at 3 feet
	4	4		7						
	5	3								Tan Fine Silty SAND (SM)
	6									
15										
	7									Yellowish Brown Medium Clayey SAND (SC)
	8	0								
	9	0 0		0	28	28	11	17	⑦	Brown CLAY (~~CL~~) ~~SC~~ SP-SC
	10	0								
	11									
10										
	12									Tan Coarse SAND (SP)
	13									
	14	1								
	15	3 5		8						
	16	7								
5										
	17									
	18	4								
	19	9 6		15						Avg. N ≈ 8
	20	3								
	21									
0										
	22									
	23									
	24	3								Gray Lean CLAY (~~CL~~) with shells
	25	3 4		7	36	37	24	13	㉑	SC
	26	6								
-5										
	27									
	28	2								Gray Fine Silty SAND (SM) with fine shells
	29	3 3		6						
	30	3								

N - Standard Penetration Test Resistance (ASTM D 1586)
R.Q.D. - Rock Quality Designation

NOTES:
Geophysical logging performed from 0 - 75 feet due to borehole collapse.

LOG OF BORING P- 1

HDR
5700 Lake Wright Drive
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CLIENT: Southeastern Public Service Authority
PROJECT: Cell VII
LOCATION: SPSA Regional Landfill
Suffolk, VA

PROJECT NO. 2889-011-018

DRILLING DETAILS:
Drilled by Fishburn Drilling using CME-75HD and Mud Rotary. Boring completed 4/11/2007.

SURFACE ELEVATION:
BORING DEPTH (ft): 100.00
PROPOSED SUBGRADE ELEVATION: -22.0

GROUNDWATER DEPTH AT COMPLETION (ft):
GROUNDWATER DEPTH AFTER 24 HRS (ft):

ELEVATION (feet)	DEPTH (feet)	BLOW COUNT	PERCENT RECOVERY / R.Q.D.	N-value	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
-10	31–34									
	34–36	1 2 2 3		4						
-15	36–38									Gray CLAY (CL)
	38–40	2 3 3 4		6						Gray Fine Silty SAND (SM) with fine shells
-20	40–42	3 4 5		9						Some medium size shells present at 40 feet
	42–44				37	38	29	9	48	Gray SILT (ML)
	44–46	2 3 4 4		7						Gray Fine Silty SAND (SM) with trace clay and shells
-25	46–48	4 4 5 5		9						Fine shell matrix at 46 feet
	48–50	2 3 3 5		6						
-30	50–52	3 4 6 7		10						
	52–54	2 3 4 5		7						
	54–56	4 5 5 7		10						
-35	56–58	4 4 5 7		9						
	58–60	3 3 4 5		7						

N - Standard Penetration Test Resistance (ASTM D 1586)
R.Q.D. - Rock Quality Designation

NOTES:
Geophysical logging performed from 0 - 75 feet due to borehole collapse.

LOG OF BORING P- 1

SHEET 3 of 4

HDR

5700 Lake Wright Drive
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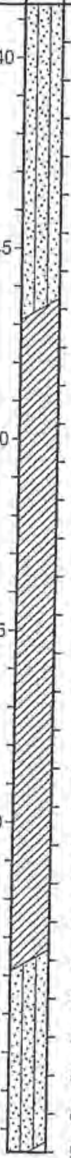
http://www.HDRinc.com

CLIENT:	Southeastern Public Service Authority
PROJECT:	Cell VII
LOCATION:	SPSA Regional Landfill Suffolk, VA
PROJECT NO.	2889-011-018

DRILLING DETAILS:
Drilled by Fishburn Drilling using CME-75HD and Mud Rotary. Boring completed 4/11/2007.

SURFACE ELEVATION:
BORING DEPTH (ft): 100.00
PROPOSED SUBGRADE ELEVATION: -22.0
GROUNDWATER DEPTH AT COMPLETION (ft):
GROUNDWATER DEPTH AFTER 24 HRS (ft):



ELEVATION (feet)	SOIL SYMBOL	DEPTH (feet)	SAMPLES	BLOW COUNT	PERCENT RECOVERY / R.Q.D. N-value	MOISTURE CONTENT (%)	LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	FIELD DATA					LAB DATA	ATTERBERG LIMITS				
-40		61									
		62									
		63		2 3 4 7							Increased shell content at 63 feet
		64			7						
		65									
-45		66									
		67									
		68		2 3 4 6		35	39	21	18	㉗	Gray CLAY (CL) with shells SC
		69			7						
		70									
-50		71									
		72									
		73		2 4 4 6							
		74			8						
		75									
-55		76									
		77									
		78		3 3 5 5							
		79			8						
		80									
-60		81									
		82									
		83		3 4 5 8							
		84			9						
		85									Gray Fine Silty SAND (SM) with clay and shells
-65		86									
		87									
		88		4 5 5 7							
		89			10						
		90									

N - Standard Penetration Test Resistance (ASTM D 1586)
R.Q.D. - Rock Quality Designation

NOTES:
Geophysical logging performed from 0 - 75 feet due to borehole collapse.

LOB 2889 SPSA CELL VII TEST.GPJ 7/12/07

LOG OF BORING P- 1

SHEET 4 of 4

HDR
5700 Lake Wright Drive
Suite 300
Norfolk, VA 23502
757.222.1500
757.222.1515
http://www.HDRinc.com

CLIENT: Southeastern Public Service Authority
PROJECT: Cell VII
LOCATION: SPSA Regional Landfill
Suffolk, VA

PROJECT NO. 2889-011-018

DRILLING DETAILS:
Drilled by Fishburn Drilling using CME-75HD and Mud Rotary. Boring completed 4/11/2007.

SURFACE ELEVATION:
BORING DEPTH (ft): 100.00
PROPOSED SUBGRADE ELEVATION: -22.0

GROUNDWATER DEPTH AT COMPLETION (ft):
GROUNDWATER DEPTH AFTER 24 HRS (ft):

ELEVATION (feet)	SOIL SYMBOL	DEPTH (feet)	SAMPLES	BLOW COUNT	PERCENT RECOVERY / R.Q.D. N-value	MOISTURE CONTENT (%)	LL	PL	PI	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	▨										Gray CLAY (CL) wih shells
	▨	91									
-70	▨										
	▨	92									
	▨	93	☒	2 5 5 6							
	▨	94			10						
	▨	95									
	▨	96									
-75	▨										
	▨	97									
	▨	98	☒	0 3 4 6							
	▨	99			7						
	▨	100									
											Boring Terminated at 100 feet

N - Standard Penetration Test Resistance (ASTM D 1586)
R.Q.D. - Rock Quality Designation

NOTES:
Geophysical logging performed from 0 - 75 feet due to borehole collapse.

of 760 mm (30 in).

falling weight onto the
he ground surface, the
free fall and height of
igs use a rope wrapped
which then tightens on
il the weight is visually
pe is released with the
ound the power pulley
ll be obtained. Several
l hoist-trip device. This
uch as pushing a rock,
s also contribute error
situ).
$N \geq 100$. The log may
g 70 blows for 150 mm
arge blow counts both
id equipment wear and
y ASTM at 100 assists
better identify drilling

status of cohesionless
both cohesionless and
foundations. In loose
to aid in retaining the
ling out of the sampler

g of rods, the sampler
ig. 6-3a) the recovered
mmediately tested for
a) or a portable field
ed in small glass jars
th, and blow count N.
ary for sieve analyses,
The boxes of samples
for a stated period of

have been proposed.
esses. For example, in
ningless. The estimate

ATTACHMENT E

Table 6-1 Standard penetration test (SPT) correlations

Strength correlations will be given in later chapters as needed. Values shown are primarily for "order of magnitude."

	Cohesionless Soil				
N	0–10	11–30	31–50	>50	
Unit weight γ, kN/m^3	12–16	14–18	16–20	18–23	
Angle of friction ϕ	25–32	28–36	30–40	>35	
State	Loose	Medium	Dense	Very dense	
Relative density D_r	see Eq. (6-3) and Eq. (6-4) since depends on $p_0 = \gamma y$				
	Cohesive Soil				
N.	<4	4–6	6–15	16–25	>25
Unit weight† γ, kN/m^3	14–18	16–18	16–18	16–20	>20
q_u, kPa†	<25	20–50	30–60	40–200	>100
Consistency	Very soft	Soft	Medium	Stiff	Hard

† Values heavily dependent on water content.

$1\ kn/m^3 = 6,36\ pcf$

for angle of internal friction ϕ is generally conservative, and (as noted in Chap. 13) it is common to estimate ϕ as 30 to 32° for many projects.

The relative density D_r is often related to N but is often a very poor correlation. This results from N being somewhat project- and site-dependent and from D_r being rather tenuous to define (or reliably compute). As a consequence of this and some recent work which seems promising, it was decided not to include D_r in Table 6-1, but rather provide the current "best estimate" equations.

According to Marcusson and Bieganousky (1977)

$$D_r = 0.086 + 0.0083(2311 + 222N - 711(OCR) - C_1\sigma'_v)^{1/2} \qquad (6\text{-}3)$$

and according to Fardis and Veneziano (1981), who applied much of the data used to develop Eq. (6-3), the relationship is

$$\ln N = C_2 + 2.06 \ln D_r + C_3 \ln \sigma'_v \qquad (6\text{-}4)$$

where $C_1 = 7.7$ for σ'_v in kPa; 53 for psi units
C_2 = depth function which should be determined at a site by measuring N and D_r†
$C_3 = 0.222$ for σ'_v in kPa; 0.442 for psi units
OCR = overconsolidation ratio defined by Eq. (11-2)

Both of these equations are based on regression analyses. Equation (6-3) is based on four dissimilar soils and a large number of tests and claims a 78 percent reliability with a ±0.075 standard deviation.

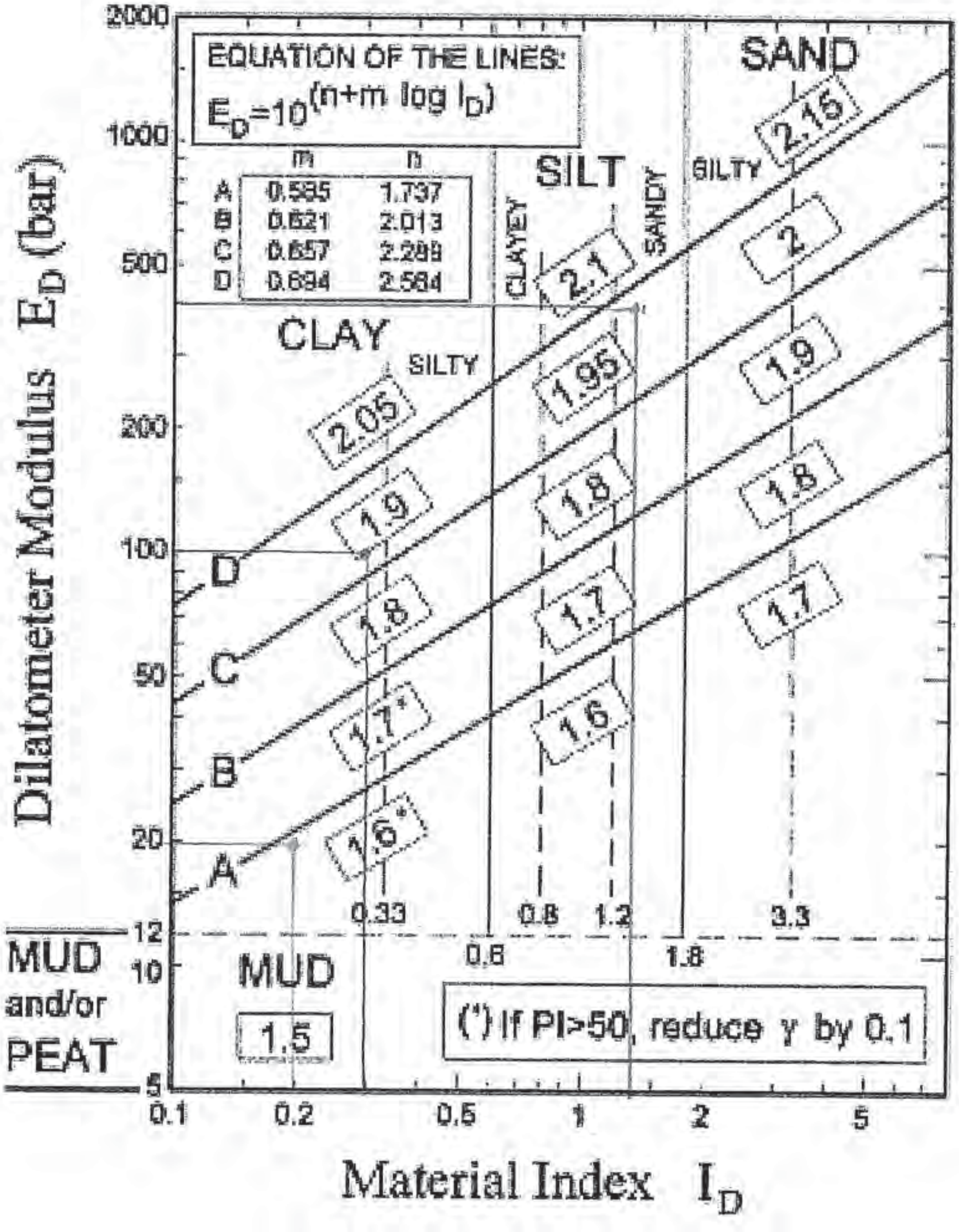
Example 6-2 Given: the SPT blow count at a depth of 4 m is 12. The soil is very sandy with traces of gravel and has an estimated unit weight $\gamma = 17.9$ kN/m^3. The soil is damp but above the water table.

---

† If no correlation is made for C_2, use the value of $C_2 = 2.67$ obtained from the data base used for the equation.

ATTACHMENT F

SOIL DESCRIPTION and estimated γ / γ_w



Source: The Flat Dilatometer Test (DMT) in Soil Investigations, Report of the ISSMGE Technical Committee 16, 2001

ATTACHMENT G

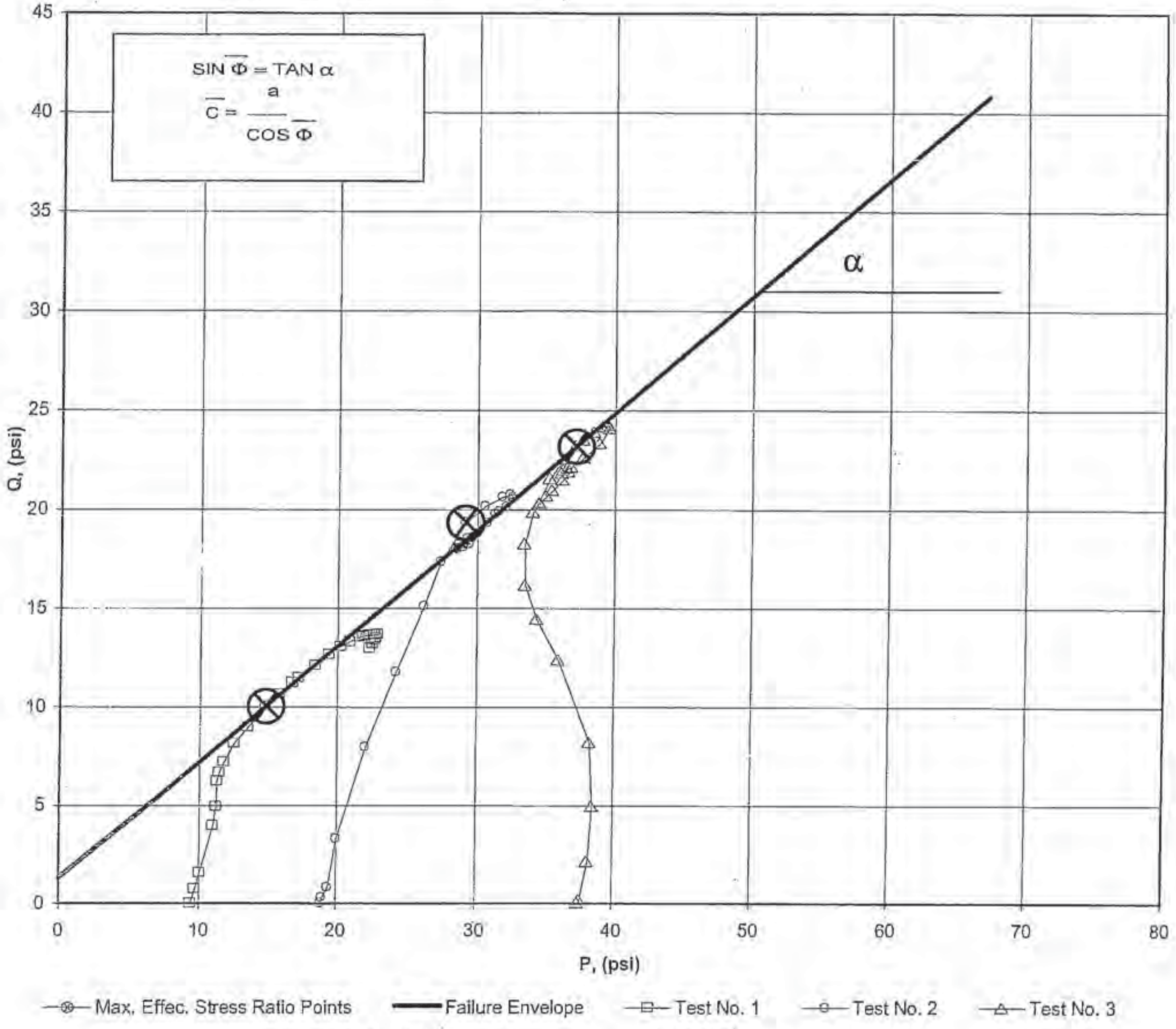
geotechnics
INTEGRITY IN TESTING

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

ASTM D4767-95 / AASHTO T297-94 (SOP-S28)

Client	HDR RALEIGH	Boring No.	OW-2
Client Reference	SPSA	Depth(ft.)	34.1-35.7
Project No.	2008-592-01	Sample No.	3
Lab ID	2008-592-01-03		

Consolidated Undrained Triaxial Test with Pore Pressure



	Undrained		Drained	
a =	1.32 (190 psf)	$\overline{C}$ =	1.63	(235 psf)
α =	30.5	$\overline{\Phi}$ =	36.04	

Tested By TMS Date 6/24/08 Approved By *MM* Date 7-7-08

ATTACHMENT H

geotechnics
INTEGRITY IN TESTING

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

ASTM D - 4767 (SOP-S28)

Client	HDR RALEIGH		
Client Reference	SPSA		
Project No.	2008-592-01		
Lab ID	2008-592-01-03	Specific Gravity (assumed)	2.70

Visual Description: GRAY SILTY SAND (UNDISTURBED)

SAMPLE CONDITION SUMMARY

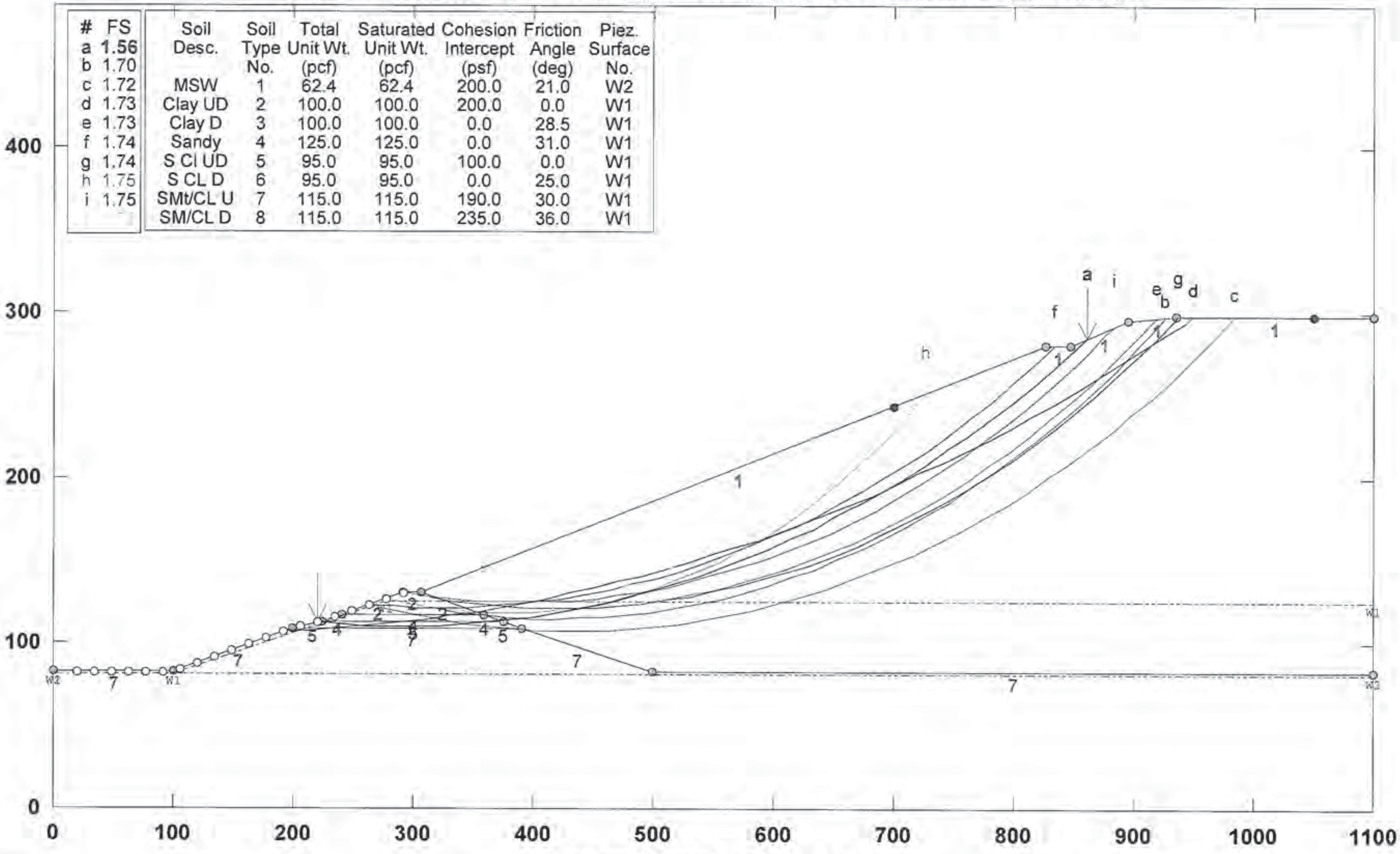
Boring No.	OW-3	OW-3	OW-3
Depth (ft)	34.7-35.2	34.1-34.6	35.2-35.7
Sample No.	3	3	3
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.005	0.005	0.005
Back Pressure (psi)	40	39.9	50
Consolidation Time (days)	1	1	1
Initial State (w%)	34.0	34.0	37.1
Total Unit Weight (pcf)	111.6	115.5	114.9
Dry Unit Weight (pcf)	83.3	86.2	83.8
Final State (w%)	34.7	33.9	33.1
Initial State Void Ratio,e	1.024	0.955	1.012

Tested By TMS Date 6/24/08 Input Checked By MMS Date 7-7-08

ATTACHMENT 1

SPSA Cell VII Excavated Sideslope Undrained Analysis

p:\tyanoschak\spsa cell vii\slope stability analyses\excss1.pl2 Run By: T. Yanoschak 8/16/2008 06:48PM



#	FS
a	1.56
b	1.70
c	1.72
d	1.73
e	1.73
f	1.74
g	1.74
h	1.75
i	1.75

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W2
Clay UD	2	100.0	100.0	200.0	0.0	W1
Clay D	3	100.0	100.0	0.0	28.5	W1
Sandy	4	125.0	125.0	0.0	31.0	W1
S Cl UD	5	95.0	95.0	100.0	0.0	W1
S CL D	6	95.0	95.0	0.0	25.0	W1
SMt/CL U	7	115.0	115.0	190.0	30.0	W1
SM/CL D	8	115.0	115.0	235.0	36.0	W1

PCSTABL5M/si FSmin=1.56

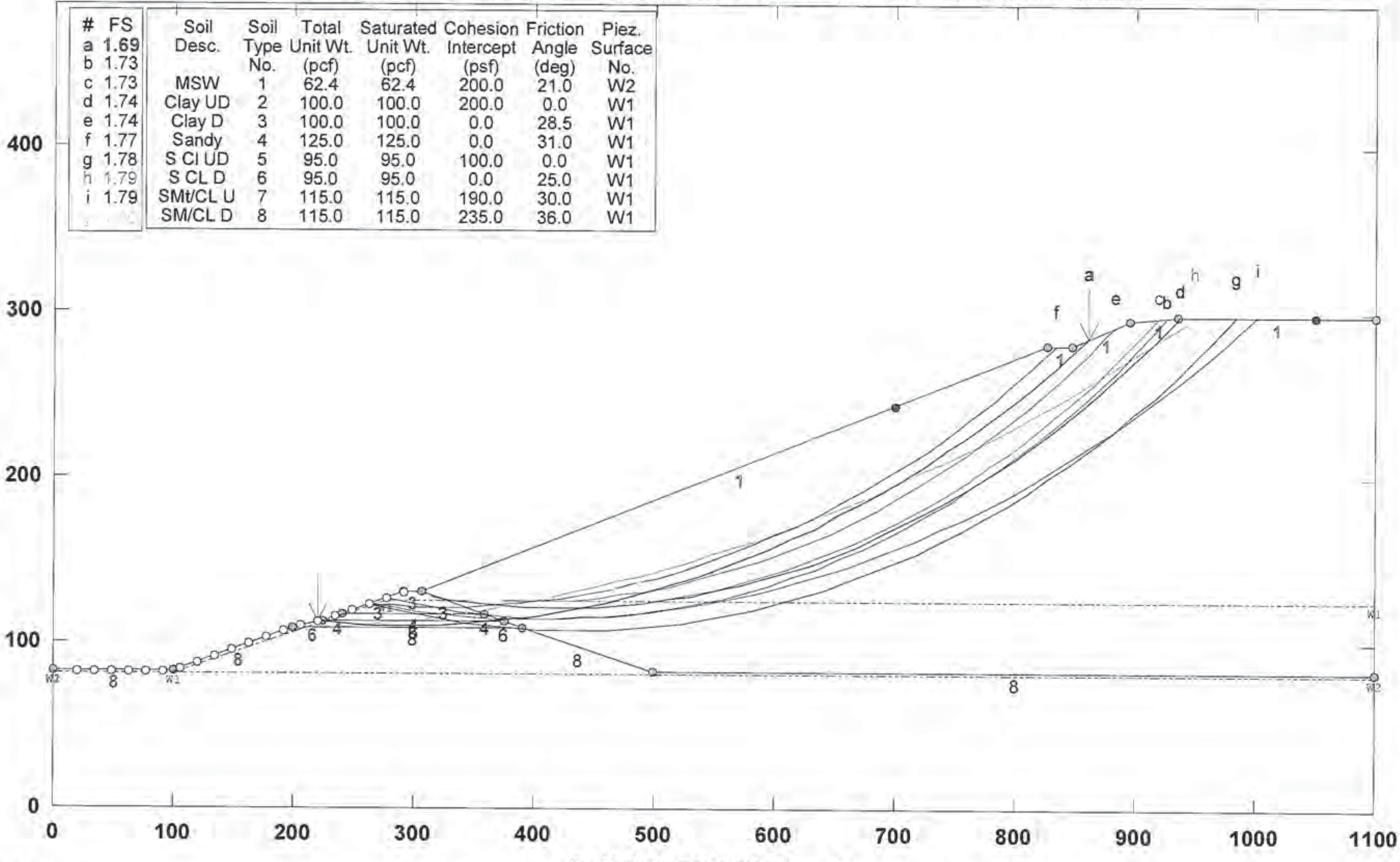
Safety Factors Are Calculated By The Modified Bishop Method

STED

ATTACHMENT J

SPSA Cell VII Excavated Sideslope Drained Analysis

p:\tyanoschak\spsa cell vii\slope stability analyses\excss2.pl2 Run By: T. Yanoschak 8/16/2008 06:56PM



#	FS
a	1.69
b	1.73
c	1.73
d	1.74
e	1.74
f	1.77
g	1.78
h	1.79
i	1.79

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
MSW	1	62.4	62.4	200.0	21.0	W2
Clay UD	2	100.0	100.0	200.0	0.0	W1
Clay D	3	100.0	100.0	0.0	28.5	W1
Sandy	4	125.0	125.0	0.0	31.0	W1
S Cl UD	5	95.0	95.0	100.0	0.0	W1
S CL D	6	95.0	95.0	0.0	25.0	W1
SMt/CL U	7	115.0	115.0	190.0	30.0	W1
SM/CL D	8	115.0	115.0	235.0	36.0	W1

PCSTABL5M/si FSmin=1.69

Safety Factors Are Calculated By The Modified Bishop Method

STED

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SITE LIFE and VOLUMES

Project:	**SPSA**	Computed: GMW	Date: 2-11-09
Subject:	**Regional Landfill Cell VII**	Checked: TMY	Date: 2-12-09
Task:	**Airspace Calculations Cell VII - Total**	Sheet: 1	Of: 1

Objective: Determine Permitted Airspace for the Cell VII Expansion

A	10,818,079	cy, Overall Airspace Available (excluding operational cover)	
B	0.77	tons/cy, density (from latest SPSA Airspace Management Report, Feb 2008)	
C	1,225,405	tons/year (from latest SPSA Airspace Management Report, Feb 2008)	
D	**6.80**	**years Cell VII Overall will last**	**(AB/C)**
	82	months	**(D/12)**
E	4,179,594	cy, Phase 1 Option 1 Airspace Available (excluding operational cover)	
F	**2.63**	**years Cell VII Phase 1 Option 1 will last**	**(EB/C)**
	32	months	**(F/12)**
G	26-Jun-2012	Beginning Date (last day that Cells V and VI will accept waste) (from latest SPSA Airspace Management Report, Feb 2008)	
H	**13-Apr-2019**	**Last day Cell VII Overall will accept waste**	**(365.25D+G)**
I	**10-Feb-2015**	**Last day Cell VII Phase 1 Option 1 will accept waste**	**(365.25F+G)**

Piece	Cut	Fill	Net	Method	Average
Overall Cell VII	21	10,078,268	10,078,246	(F) Grid	10,079,000
	40	10,079,273	10,079,234	(F) Composite	
	39	10,079,291	10,079,252	(F) End Area	
	39	10,079,198	10,079,159	(F) Prismoidal	
Cell VII Phase 1 Option 1	398	4,049,426	4,049,028	(F) Grid	4,055,400
	440	4,057,015	4,056,576	(F) Composite	
	440	4,057,687	4,057,248	(F) End Area	
	439	4,057,582	4,057,143	(F) Prismoidal	

REFUSE SETTLEMENT

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HDR Computation

Job Number	01743-02889-018	No.	

Project	SPSA Regional Landfill	Computed	GMW	Date	6/11/2008
Subject	Cell VII Part B Permit Application	Checked	[illegible]	Date	8/21/08
Task	Refuse Settlement	Sheet	1	Of	

Objective: Estimate Refuse Settlement of Cell VII after closure.

References: Geotechnical Aspects of Landfill Design and Construction, 2002, p. 450.

Calculations: Assume only secondary compression of waste will occur after closure.

$\Delta H\acute{\alpha} = H\, C_{\alpha}'\, \log(t_2/t_1)$

Where:
$\Delta H\acute{\alpha}$ = long-term secondary settlement
H = initial thickness of waste layer before settlement
C_{α}' = modified secondary compression index (ranges from 0.03 to 0.1 from ref.)
t_2 = ending time for secondary settlement to be calculated (assume after 30 yr post-closure period)
t_1 = starting time for secondary settlement to be calculated (assume 3 yrs = avg. age of waste when cell closes after 6 yrs)

t_2 =	33	Years	(3 yr avg. waste age in Cell VII + 30 yr post-closure period)
t_1 =	3	Years	
H =	195	Feet	
C_{α}'	0.065		(middle of range provided by reference)

$\Delta H\acute{\alpha}$ = 13.2 Feet

% Settlement = $\Delta H\acute{\alpha}/H$ = $\boxed{6.8}$

Determine post-settlement final cover slope:
Initial final cover slope = 3H:1V = 18.43°
Height of 3H:1V slope between benches = 40 feet, slope length = 120 feet
Height of 3H:1V slope between benches after 6.8% settlement = 37.3 feet
Post-settlement slope = $\tan^{-1}(37.3/120) = 17.27° = 3.2H{:}1V$

Conclusion: Estimated post closure settlement of waste of 6.8% is considered within acceptable limits to avoid damage to final cover system.

LINER STRESSES and STRAIN

- Geosynthetic Stresses
- Liner Strain

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HDR Computation

Job Number	01743-02889-018	No.	

Project	SPSA Regional Landfill	Computed	GMW	Date	6/11/2008
Subject	Cell VII Part B Permit Application	Checked	AMG.	Date	8/25/08
Task	Geosynthetic Stresses - Textured Geomembrane	Sheet	1	Of	6

Objective: Determine the stresses in the geosynthetics of the base liner system.

References: 1. "Waste Containment Systems, Waste Stabilization, and Landfills"; Hari D. Sharma and Sangeeta P. Lewis
2. "Designing with Geosynthetics"; Robert M. Koerner

Given:

Side slope angle, β =	14.0	degrees
Geomembrane SG =	0.948	HDPE (unitless)
Geonet SG =	0.948	HDPE (unitless)
Geotextile Density, γ_{GT} =	8	oz/sy
Geotextile Porosity, n =	0.35	assumed
Geotextile thickness, t_{GT} =	0.07	in (assumed)
γ_w =	62.4	lb/ft^3
Slope Height, H =	44.0	ft vertical
Geomembrane thickness, t_{geo} =	0.06	in
Geonet thickness, t_{net} =	0.25	in
GCL Mass/unit area =	0.75	lb/ft^2
Geomembrane thickness, t_{40geo} =	0.04	in

Calculations:

A.) Stress due to Self-Weight (Ref. 1)

$$W = \frac{SG\ \gamma_w\ t\ (1 \times H)}{\sin\beta}$$

$$\sigma_{TA} = \frac{W \sin\beta - F}{1 \times t}$$

$$F = W \cos\beta \tan\delta$$

$$W_{tot} = W_1 + W_2 + W_3 + W_4 + W_5$$

Where:

σ_{TA} = applied tensile stress
W = geosynthetics weight
β = slope
F = interface frictional strength between geomembrane and underlying material
SG = specific gravity of geomembrane
γ_w = unit weight of water
t = geosynthetic thickness
H = slope height
δ = minimum interface friction angle for geosynthetics allowed by specs.
A = cross-sectional area of unit strip of geosynthetic = 1 x t

60 mil Geomembrane, W_1 =	53.64	lb/ft
Geonet, W_2 =	223.52	lb/ft
Geotextile, W_3 =	56.29	lb/ft
GCL, W_4 =	136.03	lb/ft
40 mil Geomembrane, W_5 =	35.76	lb/ft
$W_{geocomposite}$ =	279.81	lb/ft
δ =	21.0	degrees (Geocomposite on textured Geomembrane)
F=	104.2	lb/ft
σ_{TA} =	0	lb/ft^2

$$\text{Factor of Safety, FS} = \frac{\sigma_y\ (\text{geocomposite})}{\sigma_{TA}}$$

σ_y (geocomposite) = 180 psi

FS = NO STRESS

HDR Computation

		Job Number	01743-02889-018	No.	
Project	SPSA Regional Landfill	Computed	GMW	Date	6/11/2008
Subject	Cell VII Part B Permit Application	Checked	G.M.Y	Date	7/25/08
Task	Geosynthetic Stresses - Textured Geomembrane	Sheet	2	Of	6

A.) Stress due to Self-Weight - continued

W_{60geo} = 333.45 lb/ft

δ = 21.0 degrees (Textured Geomembrane on GCL)
F= 124.2 lb/ft

σ_{TA} = 0 lb/ft^2

Factor of Safety, FS = $\dfrac{\sigma_y \text{ (geomembrane)}}{\sigma_{TA}}$

σ_y (geomembrane) = 2,167 psi
FS = NO STRESS

W_{gcl} = 469.48 lb/ft

δ = 21.0 degrees (GCL on Geomembrane)
F= 174.8 lb/ft

σ_{TA} = 0 lb/ft^2

Factor of Safety, FS = $\dfrac{\sigma_y \text{ (gcl)}}{\sigma_{TA}}$

σ_y (gcl) = 750 psi
FS = NO STRESS

W_{40geo} = 505.24 lb/ft

δ = 21.0 degrees (Textured Geomembrane on Clay)
F= 188.2 lb/ft

σ_{TA} = 0 lb/ft^2

Factor of Safety, FS = $\dfrac{\sigma_y \text{ (40geo)}}{\sigma_{TA}}$

σ_y (40geo) = 2,100 psi
FS = NO STRESS

HDR Computation

Job Number	01743-02889-018			No.	
Project	SPSA Regional Landfill	Computed	GMW	Date	6/11/2008
Subject	Cell VII Part B Permit Application	Checked		Date	8/15/08
Task	Geosynthetic Stresses - Textured Geomembrane	Sheet	3	Of	6

B.) Stress due to Operational Cover

Operational Cover Density, γ_{OC} = 110 lb/ft^3 (assumed)
Operational Cover Thickness, t_{OC} = 18 in

Geocomposite

$F_D = W \sin\beta$ (driving force)
$F_R = W \cos\beta \tan\delta_{L1}$ (frictional force between Geocomposite and Geomembrane)
$\delta_{L1} = 21$ degrees

$W = W_{geocomposite}$ from Page 1 + Operational Cover over length of slope
279.81 lb/ft $W_{geocomposite}$ from Page 1
29,926 lb/ft Operational Cover over length of slope
$W =$ 30,206 lb/ft

$F_D =$ 7,328 lb/ft
$F_R =$ 11,249 lb/ft

Tension in Geocomposite = $F_D - F_R$
Tension in Geocomposite = -3,921 There is no stress in the geocomposite

σ_y (geocomposite) = 180 psi
FS = NO STRESS

Geomembrane

$F_D = W \sin\beta$ (driving force)
$F_R = W \cos\beta \tan\delta_{L2}$ (frictional force between Geomembrane and GCL)
$\delta_{L2} = 21$ degrees

$W = W_{geomembrane}$ from Page 2 + Operational Cover over length of slope
333.45 lb/ft $W_{geomembrane}$ from Page 2
29,926 lb/ft Operational Cover over length of slope
$W =$ 30,259 lb/ft

$F_D =$ 7,341 lb/ft
$F_R =$ 11,268 lb/ft

Tension in Geomembrane = $F_D - F_R$
Tension in Geomembrane = -3,928 There is no stress in the geomembrane

σ_y (geomembrane) = 2,167 psi
FS = NO STRESS

HDR Computation

		Job Number	01743-02889-018	No.	
Project	SPSA Regional Landfill	Computed	GMW	Date	6/11/2008
Subject	Cell VII Part B Permit Application	Checked		Date	3/25/08
Task	Geosynthetic Stresses - Textured Geomembrane	Sheet	4	Of	6

B.) Stress due to Operational Cover - continued

Operational Cover Density, γ_{OC} = 110 lb/ft^3 (assumed)
Operational Cover Thickness, t_{OC} = 18 in

Gcl

$F_D = W \sin\beta$ (driving force)
$F_R = W \cos\beta \tan\delta_{L3}$ (frictional force between Gcl and Geomembrane)
$\delta_{L3} = 21$ degrees

$W = W_{gcl}$ from Page 2 + Operational Cover over length of slope
469.48 lb/ft W_{gcl} from Page 2
29,926 lb/ft Operational Cover over length of slope
W = 30,395 lb/ft

F_D = 7,374 lb/ft
F_R = 11,319 lb/ft

Tension in Gcl = $F_D - F_R$
Tension in Gcl = -3,945 There is no stress in the gcl

σ_y (gcl) = 750 psi
FS = NO STRESS

40Geo

$F_D = W \sin\beta$ (driving force)
$F_R = W \cos\beta \tan\delta_{L4}$ (frictional force between Geomembrane and Clay Liner)
$\delta_{L4} = 21$ degrees

$W = W_{40geo}$ from Page 2 + Operational Cover over length of slope
505.24 lb/ft W_{40Geo} from Page 2
29,926 lb/ft Operational Cover over length of slope
W = 30,431 lb/ft

F_D = 7,383 lb/ft
F_R = 11,332 lb/ft

Tension in 40Geo = $F_D - F_R$
Tension in 40Geo = -3,950 There is no stress in the gcl

σ_y (40Geo) = 1,250 psi
FS = NO STRESS

HDR Computation

Job Number	01743-02889-018			**No.**	
Project	SPSA Regional Landfill	**Computed**	GMW	**Date**	6/11/2008
Subject	Cell VII Part B Permit Application	**Checked**		**Date**	8/25/08
Task	Geosynthetic Stresses - Textured Geomembrane	**Sheet**	5	**Of**	6

C.) Stress due to Equipment (Ref. 1)

CAT D6H LGP Dozer

Operating Wt. =	45,400	lb
Ground Contact Area =	9,254	in^2
Contact pressure =	4.9	psi

Geocomposite

$F_D = W \sin\beta$ (driving force)

$F_R = W \cos\beta \tan\delta_{L1}$ (frictional force between Geocomposite and Geomembrane)

$\delta_{L1} = 21$ degrees

$W = W_{geocomposite}$ from Page 1 + Operational Cover over length of slope+ Operational equipment

30,206 lb/ft $W_{geocomposite}$ from Page 1 + Operational Cover

706 lb/ft Operational Equipment

W = 30,912 lb/ft

$F_D =$ 7,499 lb/ft

$F_R =$ 11,512 lb/ft

Tension in Geocomposite = $F_D - F_R$

Tension in Geocomposite = -4,012 There is no stress in the geocomposite

σ_y (geocomposite) = 180 psi

FS = NO STRESS

Geomembrane

$F_D = W \sin\beta$ (driving force)

$F_R = W \cos\beta \tan\delta_{L2}$ (frictional force between Geomembrane and GCL)

$\delta_{L2} = 21$ degrees

$W = W_{geomembrane}$ from Page 1 + Operational Cover over length of slope+ Operational equipment

30,259 lb/ft $W_{geomembrane}$ from Page 2 + Operational Cover

706 lb/ft Operational Equipment

W = 30,966 lb/ft

$F_D =$ 7,512 lb/ft

$F_R =$ 11,532 lb/ft

Tension in Geomembrane = $F_D - F_R$

Tension in Geomembrane = -4,019 There is no stress in the geomembrane

σ_y (geomembrane) = 2,167 psi

FS = NO STRESS

HDR Computation

		Job Number	01743-02889-018	No.	
Project	SPSA Regional Landfill	Computed	GMW	Date	6/11/2008
Subject	Cell VII Part B Permit Application	Checked		Date	9/15/08
Task	Geosynthetic Stresses - Textured Geomembrane	Sheet	6	Of	6

C.) Stress due to Equipment (Ref. 1)

CAT D6H LGP Dozer
Operating Wt. = 45,400 lb
Ground Contact Area = 9,254 in^2
Contact pressure = 4.9 psi

GCL

$F_D = W \sin\beta$ (driving force)
$F_R = W \cos\beta \tan\delta_{L3}$ (frictional force between GCL and Geomembrane)
$\delta_{L3} = 21$ degrees

$W = W_{gcl}$ from Page 1 + Operational Cover over length of slope + Operational Equipment
30,395 lb/ft W_{gcl} from Page 3 + Operational Cover
706 lb/ft Operational Equipment
$W =$ 31,102 lb/ft

$F_D =$ 7,545 lb/ft
$F_R =$ 11,582 lb/ft

Tension in GCL = $F_D - F_R$
Tension in GCL = -4,037 There is no stress in the GCL

σ_y (GCL) = 750 psi

FS = NO STRESS

40Geo

$F_D = W \sin\beta$ (driving force)
$F_R = W \cos\beta \tan\delta_{L4}$ (frictional force between Geomembrane and Clay Liner)
$\delta_{L4} = 21$ degrees

$W = W_{40Geo}$ from Page 1 + Operational Cover over length of slope + Operational Equipment
30,431 lb/ft W_{40Geo} from Page 3 + Operational Cover
706 lb/ft Operational Equipment
$W =$ 31,138 lb/ft

$F_D =$ 7,554 lb/ft
$F_R =$ 11,596 lb/ft

Tension in 40Geo = $F_D - F_R$
Tension in 40Geo = -4,042 There is no stress in the GCL

σ_y (40Geo) = 1,250 psi

FS = NO STRESS

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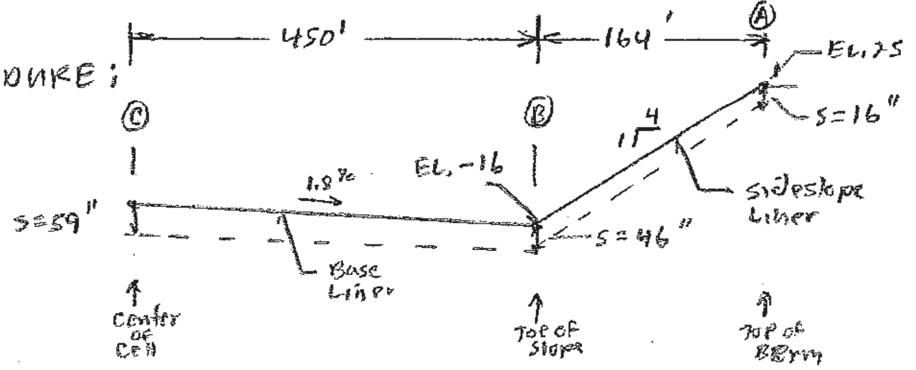
Project: SPSA Cell VII	Computed: TMY	Date: 8/25/08	
Subject: Part B Application	Checked: GMW	Date: 8/27/08	
Task: Liner Strain Analysis	Page: 1	of: 2	
Job #: 00018-02889-014	No:		

OBJECTIVE: Determine whether foundation settlement will result in excessive strain within the 60 mil and 40 mil geomembrane components within the Cell VII bottom liner system.

Assumptions: ① Yield strain for 60 mil and 40 mil textured HDPE geomembrane = 12% per project specs.
② Assume max. foundation settlement as described in Foundation Settlement calcs.
③ Assume strain in liner is constant between points evaluated.

PROCEDURE:

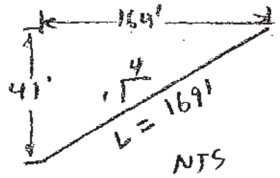


NTS

From Section A of Foundation Settlement Calcs., assume liner settlements as shown above.

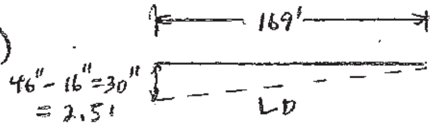
For sideslope liner:

undeformed liner length (L):



$L = \sqrt{41^2 + 164^2}$
$= 169'$

deformed liner length (LD)

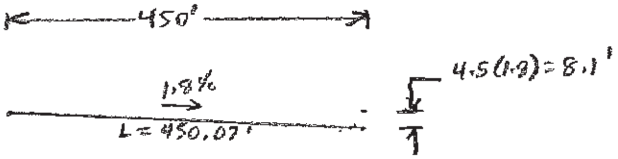


$L_D = \sqrt{169^2 + 2.5^2} = 169.02'$

$\therefore$ Liner strain $= \frac{169.02' - 169'}{169'} \approx 0.01\% < 12\%$ (yield strain) OK

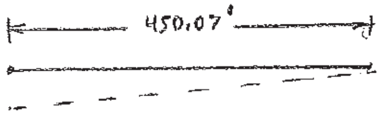
For base liner:

undeformed liner length (L):



$L = \sqrt{450^2 + 8.1^2} = 450.07'$

deformed length (L_D):



$59'' - 46'' = 13''$
$= 1.08'$

$L_D = \sqrt{450.07^2 + 1.08^2} = 450.071'$

$\therefore$ liner strain $= \dfrac{450.071 - 450.07}{450.07'} \approx 0.0002\,\% < 12\%$ OK

CONCLUSION:

Cell VII liner strains due to differential settlement of the bottom liner system are well below yield strain of HDPE geomembrane (12%). Liner strains are therefore not excessive.

GEOTEXTILE FILTER

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Project: SPSA Cell VII		Computed: TMY	Date: 8/27/08
Subject: Part B Application		Checked: DTD	Date: 8/29/08
Task: Geotextile Filter Calcs.		Page: 1	of: 3
Job #: 00018-02889-014		No:	

OBJECTIVE: Confirm that Separator geotextile specified for use in geocomposite drainage layer (GDL) and gravels drains of cell VII will adequately filter soil and prevent it from entering LCS.

ASSUMPTIONS:

① Use procedure in "Geotechnical Aspects of Landfill Design and Construction", 2002, p. 259.

② Since protective layer for bottom liner system will most likely come from the Cell VII borrow pit, Use soil test results from Cell VII Part A application to characterize protective cover.

③ From Cell VII Spec. Section 02900, Apparent Opening Size (AOS) of separator geotextile = #70 U.S. Sieve = 0.212 mm = O_{95}

PROCEDURE:

Summarize Cell VII Part A Sieve Analyses for soil samples obtained from depths 0-40' (approximate depth of borrow pit).

Soil Sample	-200 (%)	d_{85} (mm)	d_{60} (mm)	d_{50} (mm)	d_{10} (mm)	$Cu = \frac{d_{60}}{d_{10}}$
P1 (8-10')	6.7	1.5	0.41	0.33	0.11	3.7
B8 (29-31')	27.2	0.27	0.13	0.11	0.05	2.6
P6 (14-16')	10.4	0.9	0.21	0.20	0.07	3.0
P12 (18-20')	13.5	0.21	0.17	0.13	0.07	2.4
B8 (9-11')	10.8	0.4	0.23	0.21	0.07	3.3
P7 (38-40')	~~46.6~~ (Too Clayey for protective cover)					
P7 (13-15')	12.0	0.21	0.13	0.12	0.06	2.2
Avg.	14.3	0.57	0.21	0.18	0.07	2.87

Task Force 25 Method:

From test results, avg. fines content for protective layer soils (-200) ≈ 14.3%

Since -200 of soil is < 50%:

AOS of the fabric > No. 30 sieve (i.e. $O_{95} < 0.59$ mm)

From geotextile specs., AOS = No. 70 sieve and $O_{95} = 0.212$ mm

∴ No. 70 sieve > No. 30 sieve OK

$O_{95} = 0.212$ mm < 0.59 mm OK

Carroll Method:

$$O_{95} < (2 \text{ or } 3) d_{85}$$

O_{95} for geotextile = 0.212 mm (from specs)

d_{85} for protective layer soils = 0.57 mm

$2(d_{85}) = 1.14$ mm, $3(d_{85}) = 1.71$ mm

∴ Since $O_{95} = 0.212$ mm < (1.14 → 1.71 mm) ok

Giroud Method:

Use Case 2 for intermediate dense soils ($50\% < D_R < 80\%$) since protective layer soils will only be "tracked" in.

Since avg. Cu of soils = 2.87, use:

IF $1 < Cu < 3$ $O_{95} < 1.5 (Cu)(d_{50})$

substituting appropriate numbers:

0.212 mm $< 1.5(2.87)(0.18)$

0.212 mm < 0.77 mm OK

CONCLUSION:

Specified separator geotextile will adequately filter protective layer soil and prevent it from entering the leachate Collection system.

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UPLIFT FORCES

HDR Computation

Job No. 01743-000-018

Project:	**SPSA**	Computed: DTD	Date: 3-26-10
Subject:	**Regional Landfill Cell VII**	Checked:	Date: 3/26/10
Task:	**Uplift Forces on Cell VII**	Sheet:	Of:

Objective: Determine amount of ballast required to counteract the hydrostatic pressures.

References:
1. Cell VI Airspace Management Report - Nov 2009 prepared by HDR Engineering, Inc.
2. October 2009 Field Survey prepared by Hoggard & Eure, Inc. & spot checks 3/18/10
3. Proposed subgrade drawing, Cell VII Part B Application, HDR Engineering, Inc., August 2008
4. Geotechnical Report, Cell VII Expansion Part A Application, HDR Engineering, Inc., November 2007.
5. Waste to Soil Ratio is typically 4:1 (of the volume 20% is soil).

Solution:

Cover Soil Density =	2,970	lb/cy (110 pcf)		
MSW Density =	1,733	lb/cy		**(Ref. 1)**
or $\gamma_{msw+20\%cvrsoil}$ =	86	pcf	**A**	**(MSW Density + 20% Cover Soil Density)**
Average Subgrade Elevation =	(16)	feet MSL	**C**	**(Ref. 3)**
Static Water Elevation =	16	feet MSL	**D**	**(Ref. 4)**
Groundwater Density, γ_{gw} =	62.4	pcf	**E**	
Factor of Safety, FS =	2			

$\sigma = H\gamma$ Where:

σ = stress (psf)
H = slope height (ft)
γ = unit weight (pcf)

Hydrostatic Uplift Force = (D - C) x E

σ_{gw} = 1,997 psf

$$\sigma_{msw} = FS\sigma_{gw}$$

σ_{msw} = 3,994 psf

$$H_{msw} = \sigma_{msw}/\gamma_{msw}$$

H_{msw} = 46.3 ft over entire floor
or Elevation = 30.3 feet MSL

FOUNDATION SETTLEMENT

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ONE COMPANY
Many Solutions℠

Memo

To: Thomas Yanoschak	
From: Ted Hunkele	Project: SPSA - Cell VII
CC: White, Aaron	
Date: August 19, 2008	Job No: 2889

RE: Foundation Settlement for SPSA Landfill Cell VII

Calculations were performed to assess the foundation settlement of the proposed Cell VII (7) at the SPSA Regional Landfill near Norfolk, VA when filled with municipal waste to the final grade. The basis for these settlement calculations is the 12 borings at the 40 to 50 acre site of proposed Cell VII and the planned finish grades for the Cell VII development. The finished grade involves placing additional waste on the east flank of existing Cell V as well as raising the site elevation to 180 feet over the Cell VII site area. The existing ground surface varies from 18 to 21 feet above mean sea level (MSL).

Dilatometer soundings (DMT) were taken at 6 of the 12 boring locations in the Cell VII site area. Each DMT was carried to 100 feet below ground surface. Borings and soundings generally encountered sandy soils. All 23 samples from the borings tested as sand with fines (silt and clay) ranging from 6% to 47% of the soil composition. Groundwater as monitored in Cell VII site wells varies from elevation 11.6 to 16.0 from August to October 2007.

Soil at the SPSA Landfill site appears to extend to depths greater than 1000 feet (Mixon et al, 1989). Water well, W-2106, drilled near the site was advanced to a depth of 660 feet. The well was logged by a Virginia Division of Mineral Resources geologist. The log indicates that the generalized stratigraphy is as follows:

Well W-2106, Ground Surface Elevation = 20 feet.

Depth in Well	Formation	Generalized Soil Description	Formation Thickness
0 – 200 feet	Yorktown	Clean to Moderately Clayey Sand	200 feet
200 – 300 feet	Calvert	Silty to Sandy Clay	100 feet
300 – 500 feet	Mattaponi and Transition Beds	Sand with a trace of Clay To Silty Sandy Clay	200 feet
550 – 660 feet	Patuxent*	Sand	> 160 feet*

* Formation extends to rock at greater than 1000 feet below ground surface.

The well data indicates that the Cell VII borings and DMT soundings were taken in the Yorktown Formation. Soil properties were developed from the Dilatometer data, since it provides in-situ soil properties at 2 foot depth intervals at each sounding.

For settlement calculations, the soil was grouped by classification indicated in the boring records and related to the adjacent DMT sounding at the same depths. The average Tangent Modulus, M, for each group and its thickness was calculated. These values were then used to calculate Young's Modulus, E, using a formula in Schmertmann's DMT report (Volume 3 of 4, 1988). Soil properties for formations below the upper Yorktown are not available for this site, so an M value was assigned to each formation based on its material description and assessment of its properties compared to the Dilatometer sounding data for similar materials.

Landfill loads were based on an average refuse and daily cover unit weight of 62.4 pcf for the total height of the landfill. The change in foundation load was calculated at each group investigated based on the Boussinseq Method and concepts from the Theory of Elasticity that relates the settlement directly with E, Young's Modulus of Elasticity. All calculations were based on the final landfill surface at closure.

Cross Sections

Figure A (attached) illustrates the location of 3 sections of proposed landfill Cell VII that were investigated for settlement of the base liner. Section A used the soil properties determined from DMT soundings at borings P-1 and P-3. Section B used the soil properties determined from the DMT soundings at borings P-8 and P-12. Section C used the soil properties determined from the DMT soundings at boring P-10.

Section Liner Elevations

The locations of the base liner (see Fig. A) across *Section A* are elevation 20 at point 1, elevation -20 at point 1A, and elevation -12 at point 2. Base liner locations across *Section B* are elevation 20 at point 3, elevation -22 at point 1B, and elevation -12 at point 4. At *Section C*, the base liner is located at elevation -22 at point 6 and at elevation 20 for point 5.

Liner Settlements

Elastic settlement was calculated based on equations in Schmertmann's FHWA report. The settlement of each layer (group) was calculated by converting the DMT Tangent Modulus, M, to Young's Modulus for drained conditions. The total settlement was found by adding the settlement of all layers down to 1000 feet below ground surface. Although bedrock is expected to be deeper than 1000 feet, additional settlement below this depth is anticipated to be less than 5% of the total settlement estimated.

Settlements across the deepest portions of the liner base are fairly uniform varying from 4 to 5 feet in both Sections A and B. Section C liner base was estimated to settle approximately 2 feet at its deepest portion. Edge settlements around the landfill Cell VII is estimated to vary from 1 to 1.5 feet. See settlement calculations (attached) for individual settlement contributions from the geologic formations at all points.

Any questions, please contact me at (412) 497-6011.

Mixon, R.B.; Berquist, C.R.,Jr.; Newell, W.L.; Johnson, G.H.; Powars, D.S.; Schindler, J.S.; and Rader, E.K.; *Geologic Map and Gerealized Cross Sections of the Coastal Plain and Adjacent Parts of the Piedmont, Virginia;* USGS Map 1-2033, 1989

Schertmann, J.H.; *Guidelines for using the CPT, CPTU, and Marchetti DMT for Geotechnical Design, Volume III – DMT Test Methods and Data Reduction,* FHWA Report No. FHWA-PA-024+84-24, 1988.

ATTACHMENTS

FIGURES

Figure A……………………………….Location of Settlement Points, Plan and Elevations

SETTLEMENT POINTS

Calc. Sheet A…………………………..Section A , Point 1A
Calc. Sheet B…………………………...Section A , Point 2
Calc. Sheet C…………………………...Section B , Point 1B
Calc. Sheet D…………………………...Section B , Point 3
Calc. Sheet E……………………………Section B , Point 4
Calc. Sheet F……………………………Section C , Point 5
Calc. Sheet G……………………………Section C , Point 6

CALCULATIONS

Pages 0 through 20……………………Cell VII Settlement Analysis
(contains Section A, Point 1 settlement)

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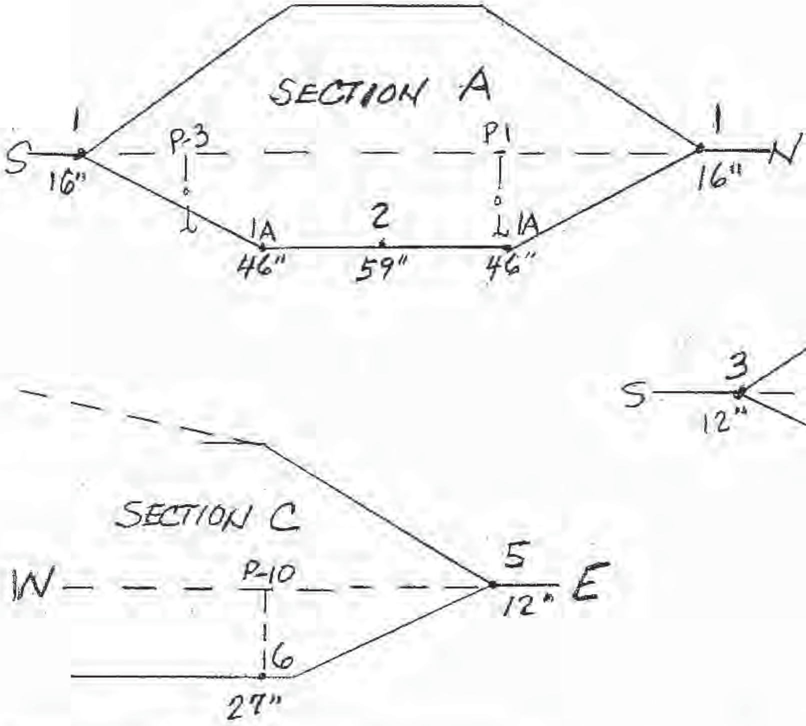
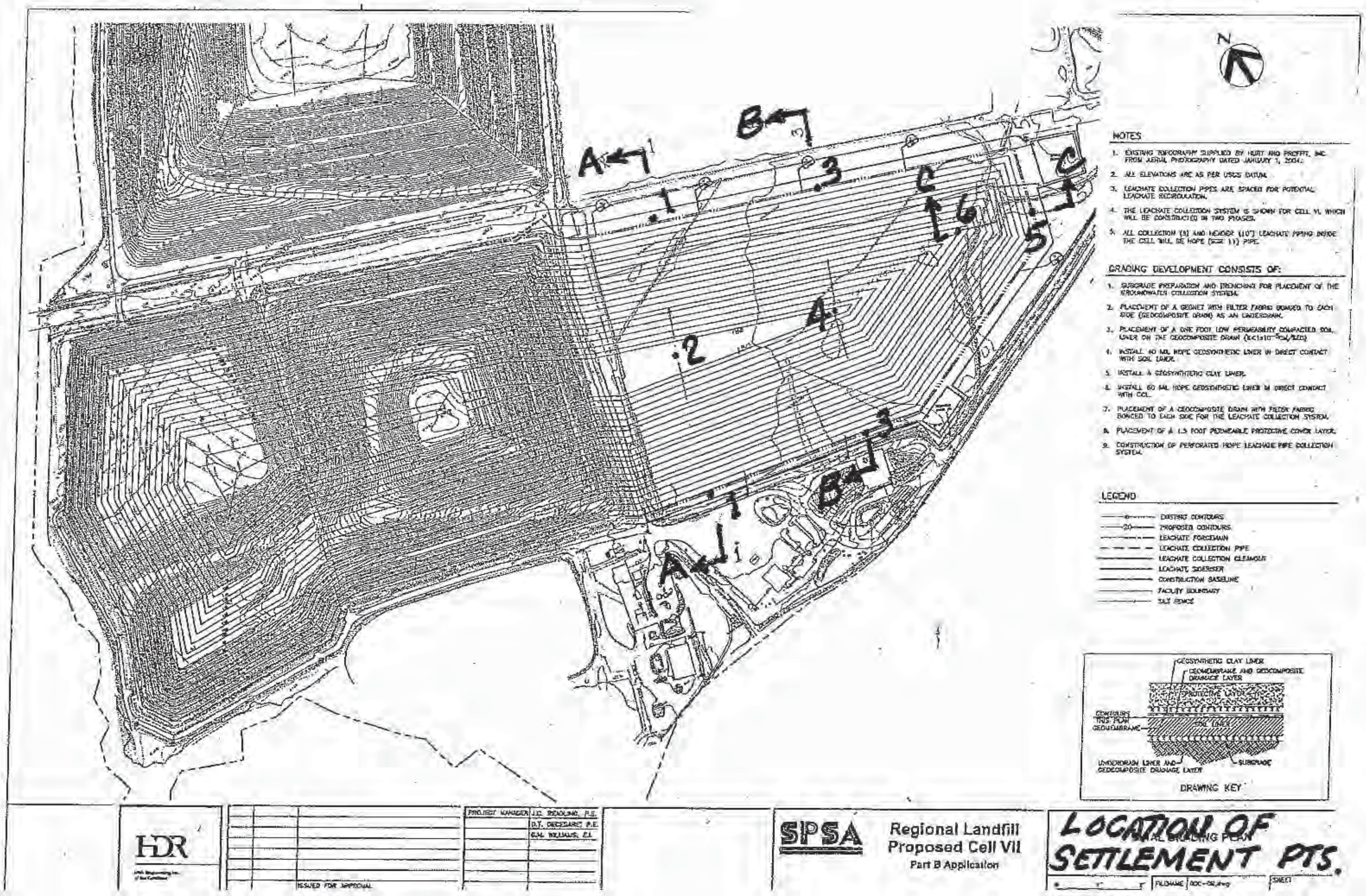
Project: SPSA ~ CELL VII
Computed: TFH Date: AUGUST, 2008
Subject: SETTLEMENT ANALYSIS
Checked: DES Date: 8/19/08
Task:
Page: 0 of:
Job #:
No:

FIGURE A





NOTES

1. EXISTING TOPOGRAPHY SUPPLIED BY HURT AND PROFFIT, INC FROM AERIAL PHOTOGRAPHY DATED JANUARY 1, 2004.
2. ALL ELEVATIONS ARE AS PER USGS DATUM.
3. LEACHATE COLLECTION PIPES ARE SPACED FOR POTENTIAL LEACHATE RECIRCULATION.
4. THE LEACHATE COLLECTION SYSTEM IS SHOWN FOR CELL VI, WHICH WILL BE CONSTRUCTED IN TWO PHASES.
5. ALL COLLECTION (8") AND HEADER (10") LEACHATE PIPING INSIDE THE CELL WILL BE HDPE (SDR 11) PIPE.

GRADING DEVELOPMENT CONSISTS OF:

1. SUBGRADE PREPARATION AND TRENCHING FOR PLACEMENT OF THE GROUNDWATER COLLECTION SYSTEM.
2. PLACEMENT OF A GEONET WITH FILTER FABRIC BONDED TO EACH SIDE (GEOCOMPOSITE DRAIN) AS AN UNDERDRAIN.
3. PLACEMENT OF A ONE FOOT LOW PERMEABILITY COMPACTED SOIL LINER ON THE GEOCOMPOSITE DRAIN ($K<1\times10^{-5}$ CM/SEC)
4. INSTALL 40 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH SOIL LINER.
5. INSTALL A GEOSYNTHETIC CLAY LINER.
6. INSTALL 60 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GCL.
7. PLACEMENT OF A GEOCOMPOSITE DRAIN WITH FILTER FABRIC BONDED TO EACH SIDE FOR THE LEACHATE COLLECTION SYSTEM.
8. PLACEMENT OF A 1.5 FOOT PERMEABLE PROTECTIVE COVER LAYER.
9. CONSTRUCTION OF PERFORATED HDPE LEACHATE PIPE COLLECTION SYSTEM.

LEGEND

EXISTING CONTOURS
PROPOSED CONTOURS
LEACHATE FORCEMAIN
LEACHATE COLLECTION PIPE
LEACHATE COLLECTION CLEANOUT
LEACHATE SIDERISER
CONSTRUCTION BASELINE
FACILITY BOUNDARY
SILT FENCE

DRAWING KEY

HDR

ISSUED FOR APPROVAL

PROJECT MANAGER J.C. REDDING, P.E.
D.T. DECESARE, P.E.
G.M. WILLIAMS, E.I.

SPSA
Regional Landfill
Proposed Cell VII
Part B Application

LOCATION OF
FINAL GRADING PLAN
SETTLEMENT PTS.

FILENAME DOC-08.dwg
SHEET

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: D. Splitstone

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section A, Point 1A

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness

M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

E is the drained Young's Modulus of Elasticity

μ is the drained Poisson Ratio for the soil type in layer n

Boring P-1 to 100 feet

Δq_s is the average bearing pressure increase at level n

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
36	36	590	0.3	438	1.3	0.4	0.7	6400	3.20	0.3
39	120	605	0.3	449	1.3	0.4	0.7	6180	3.09	0.8
49	84	585	0.3	435	1.3	0.4	0.7	5870	2.94	0.6
56	84	500	0.3	371	1.3	0.4	0.7	5715	2.86	0.6
63	48	445	0.3	331	1.3	0.4	0.7	5610	2.81	0.4
68	204	395	0.3	293	1.3	0.4	0.7	5360	2.68	1.9
85	60	540	0.3	401	1.3	0.4	0.7	5250	2.63	0.4
90	120	330	0.3	245	1.3	0.4	0.7	5225	2.61	1.3
100	1200	550	0.3	409	1.3	0.4	0.7	4960	2.48	7.3
200	1200	400	0.4	187	1.4	0.2	0.6	4750	2.38	15.3
300	1200	990	0.2	891	1.2	0.6	0.8	4490	2.25	3.0
400	1200	740	0.4	345	1.4	0.2	0.6	4245	2.12	7.4
500	6000	1710	0.2	1539	1.2	0.6	0.8	3500	1.75	6.8
1000									**Total**	46

☐ Settlement to 63 feet below the liner based on Boring P-1 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-1 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-1 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-1 DMT

▨ Settlement extrapolated from Well data & P-1 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 1.1 feet

Mattaponi Formation & Trans. Bed 0.9 feet

Calvert Formation 1.3 feet

Patuxent Formation 0.6 feet

Total Settlement 4 feet

*depth at mid-point of soil layer.
e.g. Z=1.5 feet at depth = 37.5 feet

HDR Engineering Inc.
Pittsburgh, PA

Calculation Sheet No. A

Computed: T. Hunkele
Checked: D. Splitstone

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section A, Point 2 S is the settlement at level n

$S = \Delta q_s (H) / E$ H is the soil layer thickness

M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu) (1-2\mu) / (1-\mu)$ E is the drained Young's Modulus of Elasticity

μ is the drained Poisson Ratio for the soil type in layer n

Boring P-1 to 100 feet Δq_s is the average bearing pressure increase at level n

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
36	36	590	0.3	438	1.3	0.4	0.7	6570	3.29	0.3
39	120	605	0.3	449	1.3	0.4	0.7	6560	3.28	0.9
49	84	585	0.3	435	1.3	0.4	0.7	6550	3.28	0.6
56	84	500	0.3	371	1.3	0.4	0.7	6540	3.27	0.7
63	48	445	0.3	331	1.3	0.4	0.7	6530	3.27	0.5
68	204	395	0.3	293	1.3	0.4	0.7	6515	3.26	2.3
85	60	540	0.3	401	1.3	0.4	0.7	6505	3.25	0.5
90	120	330	0.3	245	1.3	0.4	0.7	6495	3.25	1.6
100	1200	550	0.3	409	1.3	0.4	0.7	6420	3.21	9.4
200	1200	400	0.4	187	1.4	0.2	0.6	6285	3.14	20.2
300	1200	990	0.2	891	1.2	0.6	0.8	6006	3.00	4.0
400	1200	740	0.4	345	1.4	0.2	0.6	5570	2.79	9.7
500	6000	1710	0.2	1539	1.2	0.6	0.8	4295	2.15	8.4
1000									**Total**	59

☐ Settlement to 63 feet below the liner based on Boring P-1 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-1 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-1 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-1 DMT

▨ Settlement extrapolated from Well data & P-1 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 1.4 feet

Mattaponi Formation & Trans. Beds 1.1 feet

Calvert Formation 1.7 feet

Patuxent Formation 0.7 feet

Total Settlement 5 feet

*depth at mid-point of soil layer.
e.g. Z=1.5 feet at depth =37.5 feet

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section B, Point 1B

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n

Boring P-12 to 100 feet

Δq_s is the average bearing pressure increase at level n

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
0		630	0.3	468	1.3	0.4	0.7	5985	2.99	0.0
12		1270	0.3	943	1.3	0.4	0.7	5580	2.79	0.0
20		830	0.3	617	1.3	0.4	0.7	5366	2.68	0.0
31		485	0.3	360	1.3	0.4	0.7	5209	2.60	0.0
42	312	447	0.3	332	1.3	0.4	0.7	4988	2.49	2.3
68	180	373	0.3	277	1.3	0.4	0.7	4918	2.46	1.6
83	120	430	0.3	319	1.3	0.4	0.7	4872	2.44	0.9
93	84	715	0.3	531	1.3	0.4	0.7	4844	2.42	0.4
100	1200	700	0.3	520	1.3	0.4	0.7	4655	2.33	5.4
200	1200	490	0.4	229	1.4	0.2	0.6	4326	2.16	11.4
300	1200	550	0.2	495	1.2	0.6	0.8	4046	2.02	4.9
400	1200	540	0.4	252	1.4	0.2	0.6	3765	1.88	9.0
500	6000	1440	0.2	1296	1.2	0.6	0.8	2967	1.48	6.9
1000									Total	43

☐ Settlement to 100 feet below the ground surface based on Boring P-12 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-12 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-12 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-12 DMT

▨ Settlement extrapolated from Well data & P-12 DMT to 1000 feet in Patuxent Formation

Yorktown Formation	0.9 feet	Mattaponi Formation & Trans. Beds	1.2 feet
Calvert Formation	1 feet	Patuxent Formation	0.6 feet
		Total Settlement	4 feet

*depth at mid-point of soil layer.
e.g. Z=0 feet at depth = 42 feet

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: D. Spiltstone

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section B, Point 3

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-12 to 100 feet

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
0	144	630	0.3	468	1.3	0.4	0.7	570	0.29	0.1
12	96	1270	0.3	943	1.3	0.4	0.7	670	0.34	0.0
20	132	830	0.3	617	1.3	0.4	0.7	790	0.40	0.1
31	96	485	0.3	360	1.3	0.4	0.7	835	0.42	0.1
39	348	447	0.3	332	1.3	0.4	0.7	1080	0.54	0.6
68	180	373	0.3	277	1.3	0.4	0.7	1300	0.65	0.4
83	120	430	0.3	319	1.3	0.4	0.7	1352	0.68	0.3
93	84	715	0.3	531	1.3	0.4	0.7	1366	0.68	0.1
100	1200	700	0.3	520	1.3	0.4	0.7	1445	0.72	1.7
200	1200	490	0.4	229	1.4	0.2	0.6	1340	0.67	3.5
300	1200	550	0.2	495	1.2	0.6	0.8	1195	0.60	1.4
400	1200	540	0.4	252	1.4	0.2	0.6	1045	0.52	2.5
500	6000	1440	0.2	1296	1.2	0.6	0.8	680	0.34	1.6
1000									**Total**	12

☐ Settlement to 100 feet below the ground surface based on Boring P-12 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-12 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-12 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-12 DMT

▨ Settlement extrapolated from Well data & P-12 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 0.3 feet

Mattaponi Formation & Trans. Beds 0.3 feet

Calvert Formation 0.3 feet

Patuxent Formation 0.1 feet

Total Settlement 1 feet

*depth at mid-point of soil layer.
e.g. Z=6 feet at depth =6 feet

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: D. Splitstone

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section B, Point 4

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-8 to 100 feet

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
32	72	630	0.3	468	1.3	0.4	0.7	6290	3.15	0.5
38	180	520	0.3	386	1.3	0.4	0.7	6280	3.14	1.5
53	84	514	0.3	382	1.3	0.4	0.7	6265	3.13	0.7
60	84	456	0.3	339	1.3	0.4	0.7	6255	3.13	0.8
67	180	360	0.3	267	1.3	0.4	0.7	6236	3.12	2.1
82	120	748	0.3	556	1.3	0.4	0.7	6218	3.11	0.7
92	60	398	0.3	296	1.3	0.4	0.7	6204	3.10	0.6
97	156	268	0.3	199	1.3	0.4	0.7	6188	3.09	2.4
110	1080	520	0.3	386	1.3	0.4	0.7	6056	3.03	8.5
200	1200	485	0.4	226	1.4	0.2	0.6	5788	2.89	15.3
300	1200	975	0.2	878	1.2	0.6	0.8	5287	2.64	3.6
400	1200	630	0.4	294	1.4	0.2	0.6	4763	2.38	9.7
500	6000	1240	0.2	1116	1.2	0.6	0.8	3446	1.72	9.3
1000									**Total**	56

☐ Settlement to 68 feet below the liner based on Boring P-8 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-8 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-8 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-8 DMT

▨ Settlement extrapolated from Well data & P-8 DMT to 1000 feet in Patuxent Formation

Yorktown Formation	1.5	feet	Mattaponi Formation & Trans. Beds	1.1	feet
Calvert Formation	1.3	feet	Patuxent Formation	0.8	feet
			Total Settlement	5	feet

* depth at mid-point of soil layer.
e.g. Z=3.0 feet at depth = 35 feet

Calculation Sheet No. E

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: D. Splitstone

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section C, Point 5

$S = \Delta q_s (H) / E$

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

S is the settlement at level n

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results
E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-10 to 100 feet

Top ./Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
0	336	995	0.3	739	1.3	0.4	0.7	300	0.15	0.1
28	312	488	0.3	363	1.3	0.4	0.7	600	0.30	0.3
54	84	510	0.3	379	1.3	0.4	0.7	659	0.33	0.1
61	72	493	0.3	366	1.3	0.4	0.7	681	0.34	0.1
67	72	445	0.3	331	1.3	0.4	0.7	704	0.35	0.1
73	96	367	0.3	273	1.3	0.4	0.7	730	0.37	0.1
81	84	524	0.3	389	1.3	0.4	0.7	756	0.38	0.1
88	144	406	0.3	302	1.3	0.4	0.7	793	0.40	0.2
100	1200	520	0.3	386	1.3	0.4	0.7	974	0.49	1.5
200	1200	485	0.4	226	1.4	0.2	0.6	1215	0.61	3.2
300	1200	885	0.2	797	1.2	0.6	0.8	1265	0.63	1.0
400	1200	700	0.4	327	1.4	0.2	0.6	1306	0.65	2.4
500	6000	1475	0.2	1328	1.2	0.6	0.8	1295	0.65	2.9
1000									**Total**	12

☐ Settlement to 100 feet below the ground surface based on Boring P-10 & DMT Results

░ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-10 DMT

░ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-10 DMT

░ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-10 DMT

▒ Settlement extrapolated from Well data & P-10 DMT to 1000 feet in Patuxent Formation

Yorktown Formation	0.2 feet	Mattaponi Formation & Trans. Bed	0.3 feet
Calvert Formation	0.3 feet	Patuxent Formation	0.2 feet
		Total Settlement	1 feet

*depth is the mid-point of the soil layer
e.g. Z=14 feet at depth = 14 feet

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: D. Splitstone

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section C, Point 6

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-10 to 100 feet

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
41	156	488	0.3	363	1.3	0.4	0.7	3970	1.99	0.9
54	84	510	0.3	379	1.3	0.4	0.7	3907	1.95	0.4
61	72	493	0.3	366	1.3	0.4	0.7	3870	1.94	0.4
67	72	445	0.3	331	1.3	0.4	0.7	3834	1.92	0.4
73	96	367	0.3	273	1.3	0.4	0.7	3792	1.90	0.7
81	84	524	0.3	389	1.3	0.4	0.7	3750	1.88	0.4
88	144	406	0.3	302	1.3	0.4	0.7	3689	1.84	0.9
		520	0.3	386	1.3	0.4	0.7		0.00	0.0
100	1200	520	0.3	386	1.3	0.4	0.7	3293	1.65	5.1
200	1200	485	0.4	226	1.4	0.2	0.6	2916	1.46	7.7
300	1200	885	0.2	797	1.2	0.6	0.8	2658	1.33	2.0
400	1200	700	0.4	327	1.4	0.2	0.6	2448	1.22	4.5
500	6000	1475	0.2	1328	1.2	0.6	0.8	1605	0.80	3.6
1000									**Total**	27

☐ Settlement to 59 feet below the liner based on Boring P-10 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-10 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-10 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-10 DMT

▨ Settlement extrapolated from Well data & P-10 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 0.8 feet

Mattaponi Formation & Trans. Bed 0.5 feet

Calvert Formation 0.6 feet

Patuxent Formation 0.3 feet

Total Settlement 2 feet

*depth is the mid-point of the soil layer.
e.g. Z=0 feet at depth = 41 feet

HDR Engineering Inc.
Pittsburgh, PA

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Project: SPSA ~ CELL VII
Computed: TFH
Date: AUGUST, 2008
Subject: SETTLEMENT ANALYSIS
Checked: DES
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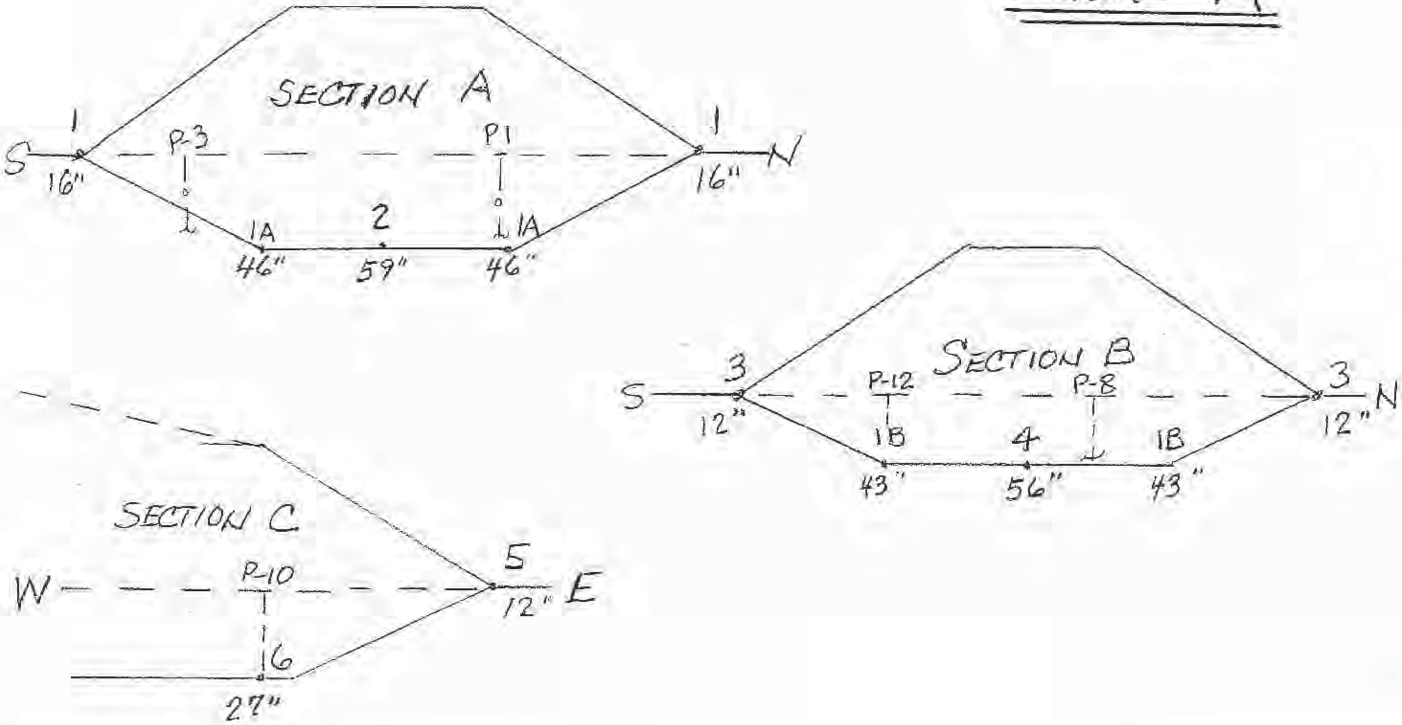
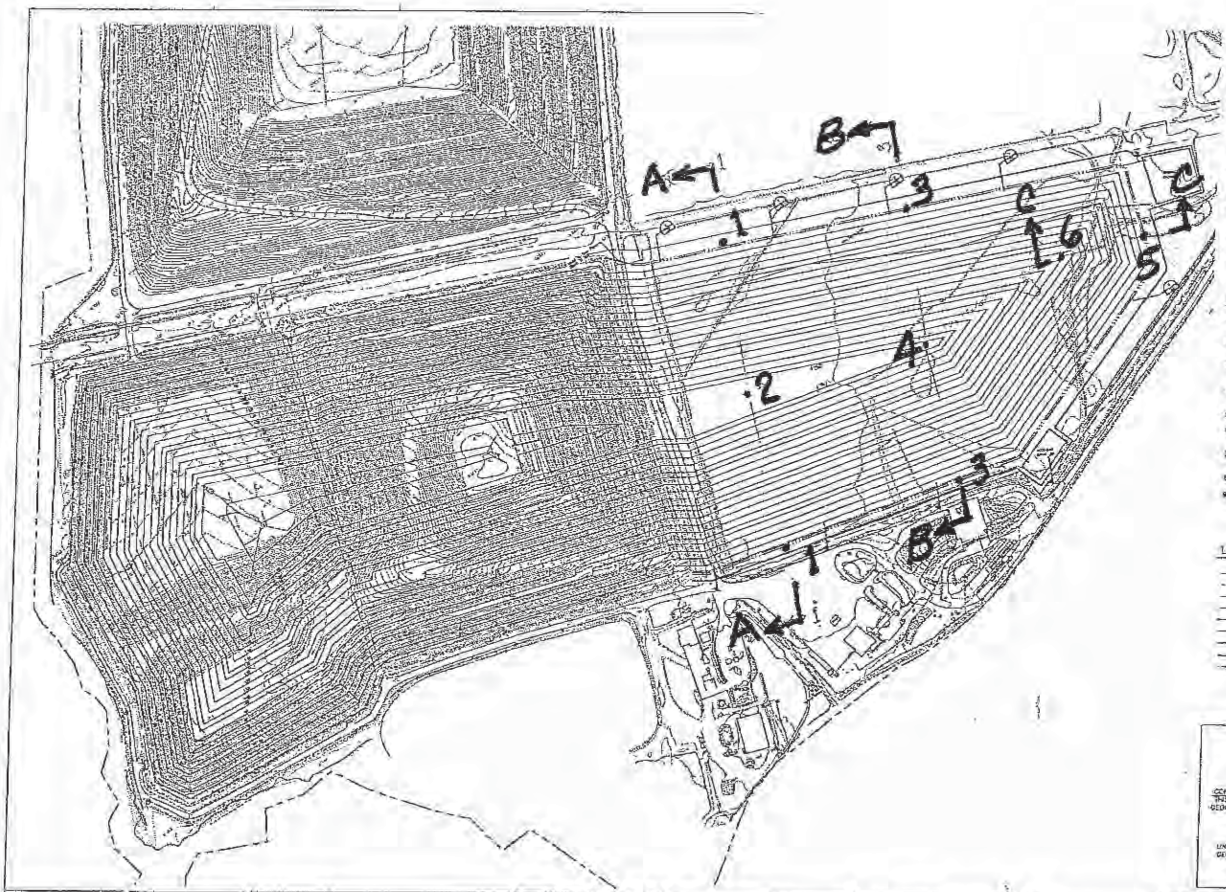
FIGURE A





NOTES

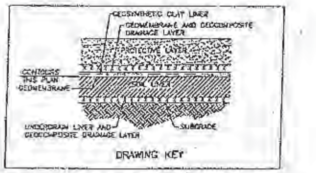
1. EXISTING TOPOGRAPHY SUPPLIED BY HURT AND PROFFIT, INC. FROM AERIAL PHOTOGRAPHY DATED JANUARY 1, 2004.
2. ALL ELEVATIONS ARE AS PER USGS DATUM.
3. LEACHATE COLLECTION PIPES ARE SPACED FOR POTENTIAL LEACHATE RECIRCULATION.
4. THE LEACHATE COLLECTION SYSTEM IS SHOWN FOR CELL VI, WHICH WILL BE CONSTRUCTED IN TWO PHASES.
5. ALL COLLECTION (8") AND HEADER (10") LEACHATE PIPING INSIDE THE CELL WILL BE HDPE (SDR 11) PIPE.

GRADING DEVELOPMENT CONSISTS OF:

1. SUBGRADE PREPARATION AND TRENCHING FOR PLACEMENT OF THE GROUNDWATER COLLECTION SYSTEM.
2. PLACEMENT OF A GEONET WITH FILTER FABRIC BONDED TO EACH SIDE (GEOCOMPOSITE DRAIN) AS AN UNDERDRAIN.
3. PLACEMENT OF A ONE FOOT LOW PERMEABILITY COMPACTED SOIL LINER ON THE GEOCOMPOSITE DRAIN. ($K \leq 1 \times 10^{-5}$ CM/SEC)
4. INSTALL 40 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH SOIL LINER.
5. INSTALL A GEOSYNTHETIC CLAY LINER.
6. INSTALL 60 MIL HDPE GEOSYNTHETIC LINER IN DIRECT CONTACT WITH GCL.
7. PLACEMENT OF A GEOCOMPOSITE DRAIN WITH FILTER FABRIC BONDED TO EACH SIDE FOR THE LEACHATE COLLECTION SYSTEM.
8. PLACEMENT OF A 1.5 FOOT PERMEABLE PROTECTIVE COVER LAYER.
9. CONSTRUCTION OF PERFORATED HDPE LEACHATE PIPE COLLECTION SYSTEM.

LEGEND

——10——	EXISTING CONTOURS
——20——	PROPOSED CONTOURS
— - — - —	LEACHATE FORCEMAIN
— — — —	LEACHATE COLLECTION PIPE
————	LEACHATE COLLECTION CLEANOUT
————	LEACHATE SIDERISER
——+——	CONSTRUCTION BASELINE
——·——	FACILITY BOUNDARY
- - - -	SILT FENCE



DRAWING KEY

HDR
HDR Engineering, Inc.

PROJECT MANAGER	J.C. READLING, P.E.
	D.T. DECESARE, P.E.
	C.M. WILLIAMS, E.I.

ISSUED FOR APPROVAL

SPSA
Regional Landfill
Proposed Cell VII
Part B Application

~~FINAL GRADING PLAN~~
LOCATION OF SETTLEMENT POINTS

FILENAME
SHEET

Project: SPSA - CELL VIII	Computed: TFH	Date: JULY, 2008	
Subject: SETTLEMENT ANALYSIS	Checked: DES	Date: 8/19/08	
Task: FOUNDATION LOADS	Page: 1	of:	
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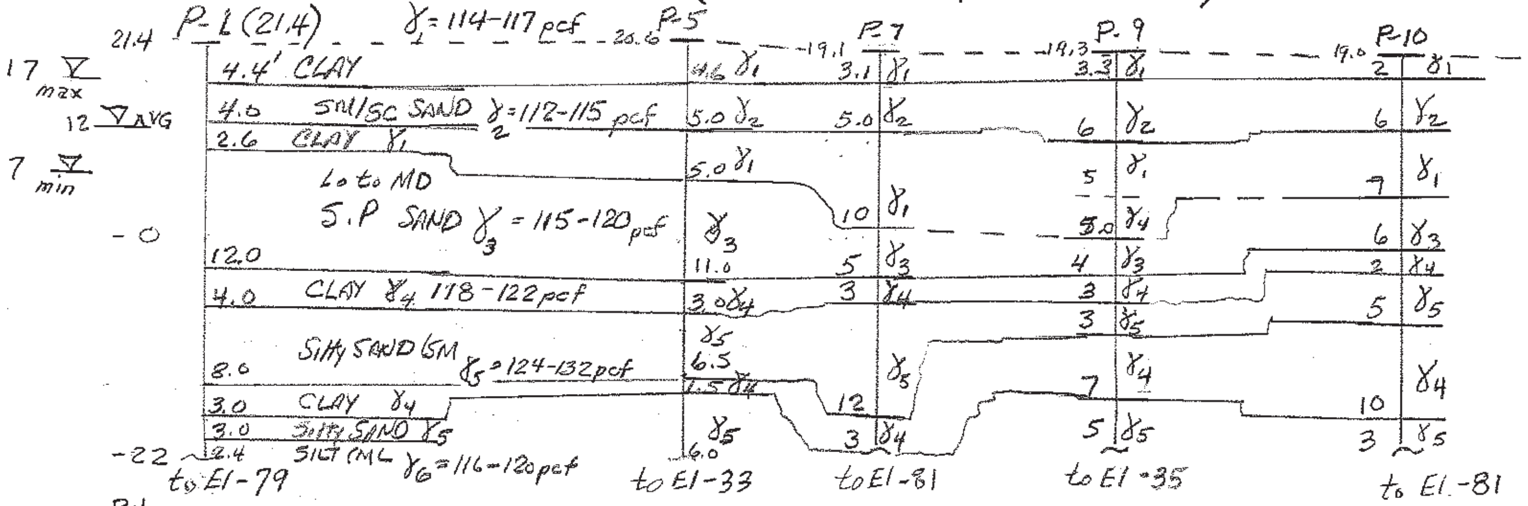
DETERMINE EXISTING LOAD @ EL-22   G.S ELEV = 20 AVG
(See SECTION A DWG C-04)



P-1

σ'_{-22} = 114(4.4) + 112(4.0) + 114(1) + (114-63)1.6 +
+ (115-63)12 + (118-63)4 + (124-63)8 +
+ 55(3) + 61(3) + $\underbrace{(116-63)}_{53}$ 2.4
= 2952 psf ✓

WL = EL. 12

P5

σ'_{-22} = 114(4.6) + 112(4) + $(\overset{49}{112-63})$1 + $(\overset{51}{114-63})$5 + $(\overset{52}{115-63})$11 + $(\overset{55}{118-63})$3 + $(\overset{61}{124-63})$6.5 + (55)1.5 +
(61)6 = 2858 psf ✓

P-7

σ'_{-22} = 114(3.1) + 112(4) + 49(1.0) + 51(10) + 52(5) + 55(3) + 61(12) + 55(3)

= 2682 psf ✓

P-9

σ_{-22} = 114(3.3) + 112(4) + 49(2) + 51(5) + 55(5) + 52(4) + 55(3) + 61(3) + 55(7) + 61(5)

= 2698 psf ✓

P-10

σ_{-22} = 114(2) + 112(5) + 49(1) + 51(7) + 52(6) + 55(2) + 61(5) + 55(10) + 61(3)
= 2654 psf ✓

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Project: SPSA - CELL VII		Computed: TFH	Date: JULY 2008
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GROUND PRESSURE @ EL -22.0

Before Excavation $\sigma_o = \dfrac{2952+2858+2682+2698+2654}{5}$

EL 12 (GWT)
EL -22 (Bot/Exc)
34'

$= 2769$ ✓ say 2770psf effective stress

$\sigma_t = 2770+34(63) = 4910\,psf$ ✓ total stress

After Excavation $\sigma_e = 0\,psf$ (effective)

$\sigma_{t_e} = 2140\,psf$ ✓ (total) (GWL El 12)

After Dewatering $\sigma_{dw} = 0\,psf$ $\sigma_{t_{dw}} = 0\,psf$

120psf
Lining & refuse* fill to ground surface

*

GS = EL 20
Bot./Exc = EL -21
41'

$\sigma_{t_{\text{fill to El 20}}} = 120psf(1.0) + 62.4(41) = 2678\,psf$

$\sigma_{t_e} = 2678 - 2140 = 538\,psf$ ✓ (effective)

@ CLOSURE to EL. 180

$\sigma_{t_{\text{fill to El.180}}} = 2678 + 160(62.4) = 12662\,psf$ ✓

$\sigma_{t_e} = 12662 - 2140 = 10{,}522\,psf$ ✓ say 10,530psf

Change in effective Stress $\Delta p = 10530 - 2770 = 7760\,psf$ ✓

Δp = Foundation Load for settlement calculation @ CENTER OF SECTION A & SECTION B

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Project: SPSA ~ CELL VII Computed: TFH Date: JULY, 2008
Subject: SETTLEMENT ANALYSIS Checked: DES Date: 8/19/08
Task: LOADS @ POINTS 2 & 4 Page: 3 of:
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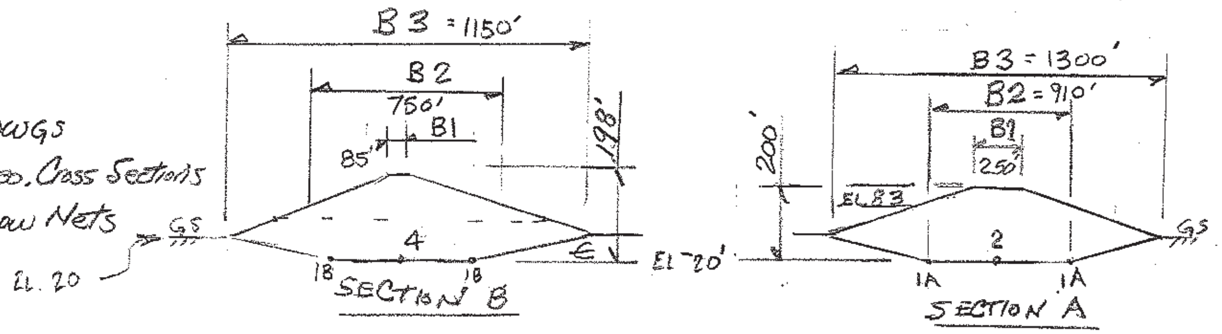
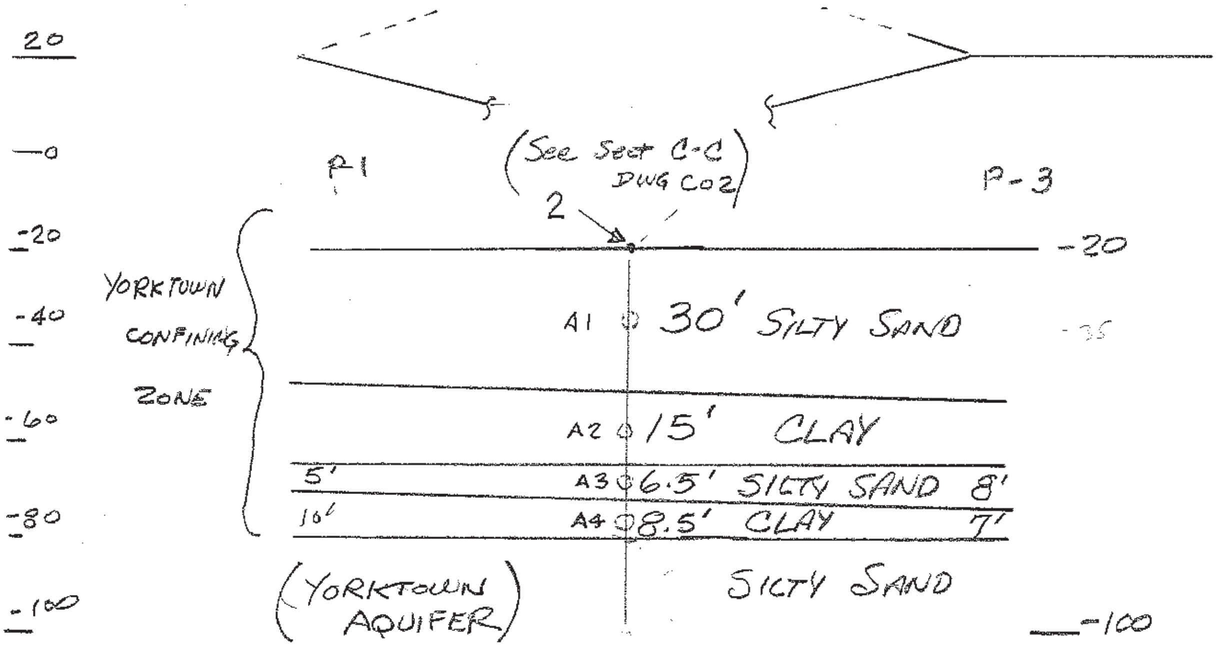
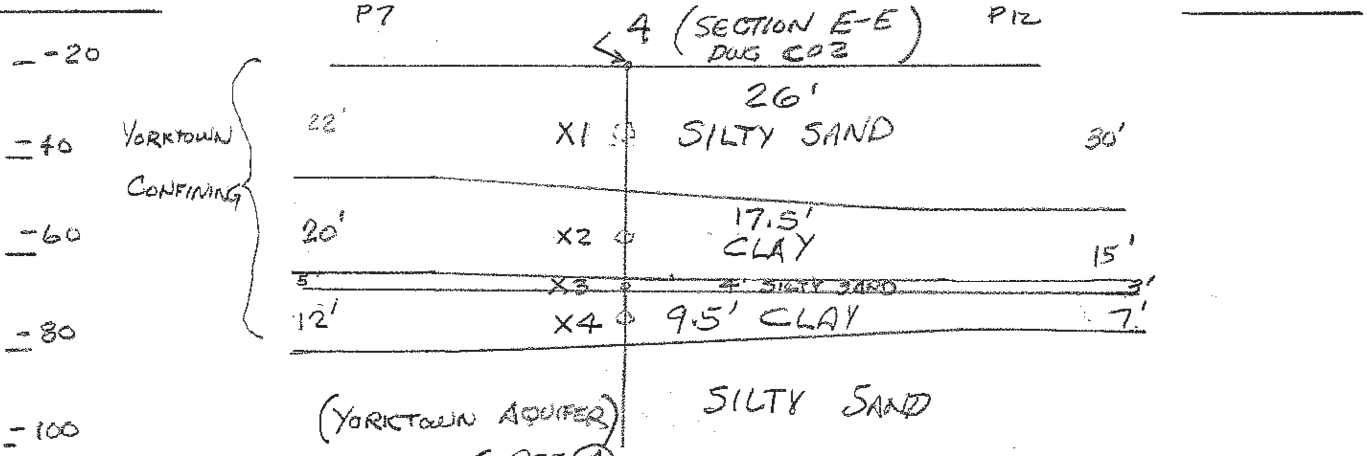
REF:
A) SPSA DWGS
C02 Geo. Cross Sections
C04 Flow Nets







UNIFORM STRIP LOADS (REF. Ⓐ ref Lambe & Whitman, 1969 "Soil Mechanics")

for. B1 7760 psf at points 2 & 4 Sections A & B respectively

$$\bar{Q}_A = \bar{Q}_B = 7760\,psf$$

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Project:	SPSA ~ CELL VII	Computed:	TFH	Date:	JULY, 2008
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UNIFORM STRIP LOADS

for B2

@EL -20 SECTION A point 1A

See Page 3 Sections

EL 180 - 83 = 97'

$\sigma_{t\,\text{fill to 83}} = 12662 - 97'(62.4) = 6610$ psf ✓

$\sigma_{te} = 6610 - 2140 = 4470$ psf ✓

∴ AVG effective stress = UNIFORM STRIP LOAD = $\bar{Q}_A$

$$\bar{Q}_A = \frac{(7760)\,250' + (7760+4470)\,0.5\,(910' - 250')}{910'}$$ ✓

$= \underline{6570 \text{ psf}}$ ✓

Section B point 1B

$\sigma_{t\,\text{fill to 83}} = 6610$

$\sigma_{te} = 4470$

$$\bar{Q}_B = \frac{7760\,(85') + (6115)(750' - 85')}{750'}$$

$= \underline{6300 \text{ psf}}$ ✓

for B3

Section A point ρ & ε $\sigma_e = 0$ = Section B

$$\bar{Q}_A = \frac{7760(250) + 6115\,(660) + \frac{6115}{2}(1300 - 910)}{1300} = \underline{5514 \text{ psf}}$$ ✓

$$\bar{Q}_B = \frac{7760(85) + 6115\,(665) + \frac{6115}{2}(1150 - 750)}{1150} = \underline{5180 \text{ psf}}$$

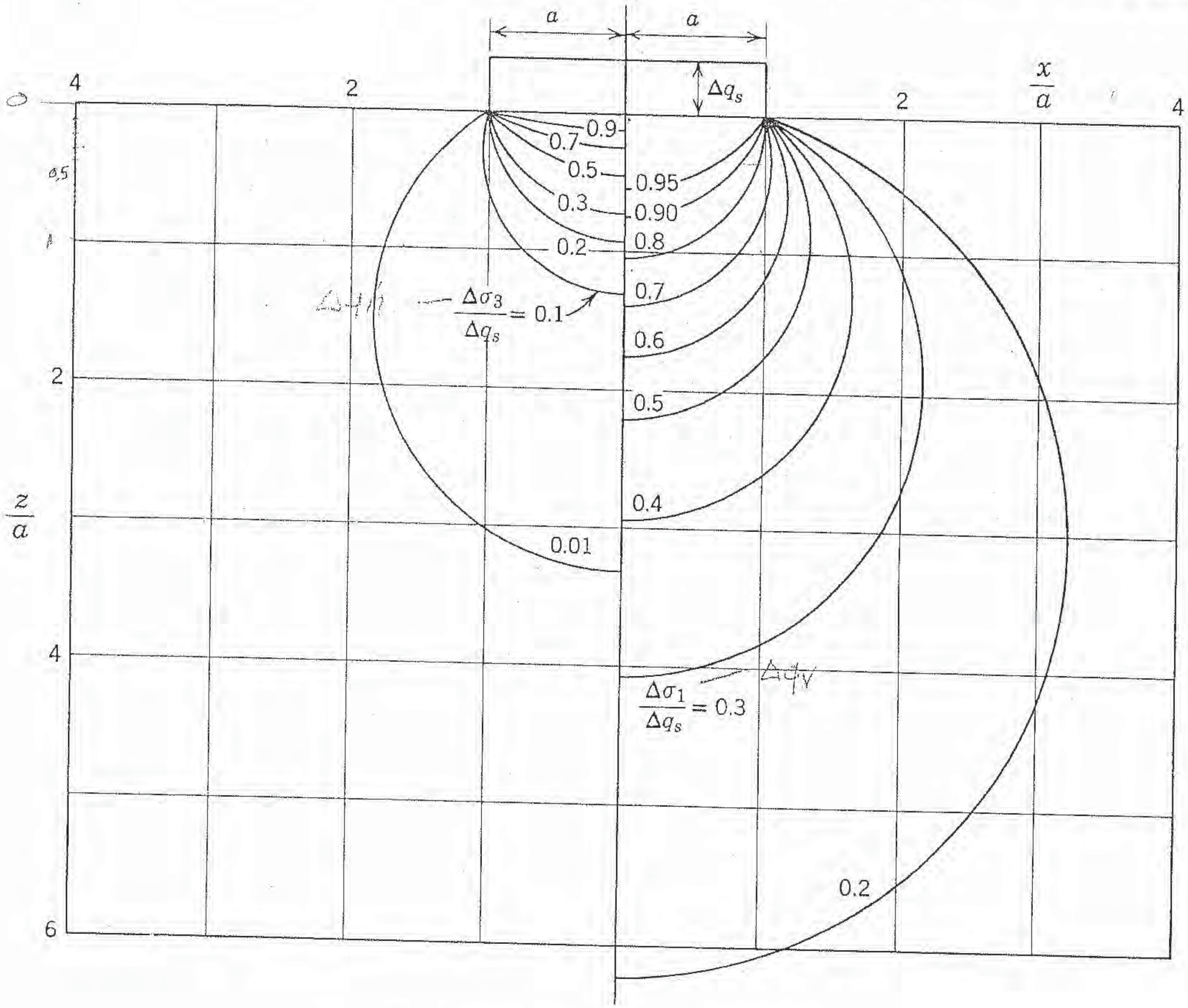

Fig. 8.7 Principal stresses under strip load.

4a

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Project:	SPSA ~ CELL VII	Computed:	TFH	Date:	JULY, 2008
Subject:	SETTLEMENT ANALYSIS	Checked:	DES	Date:	8/19/08
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$\frac{z}{a} = 6$

LOADS @ CENTER OF LF CELL AND AT DEPTHS BELOW LINER
(See Fig. 8.7 in REF Ⓐ) B2 = WIDTH OF LINER

$\frac{910}{2} = a = 455'$ (Section A) $= 375'$ (Section B) $= \frac{750}{2}$

$\Delta q_{s_A} = 6570$ psf $= 6300$ psf

SECTION A PT. 2 $x/a = 0$

$\frac{z}{a}$ @ A_1 : $\frac{15}{455} = 0.033$ ✓ $\therefore \frac{\Delta q_v}{\Delta q_s} = 0.997$ $\therefore \Delta q_{v_{A1}} = .997(6570) = 6550$ psf ✓

A_2 $\frac{37.5}{455} = 0.0825$ ✓ " $= 0.992$ $\Delta q_{v_{A2}} = .992(6570) = 6520$ psf ✓

A_3 $\frac{48.25}{455} = 0.106$ ✓ " $= 0.990$ $\Delta q_{v_{A3}} = .990(6570) = 6505$ psf ✓

A_4 $\frac{55.75}{455} = 0.123$ ✓ " $= 0.989$ $\Delta q_{v_{A4}} = .989(6570) = 6495$ psf ✓

@ $z = 247'$ $\Delta q_v = 0.95(6570) = 6240$ psf ✓

@ $z = 340'$ $\Delta q_v = 0.90(6570) = 5910$ psf ✓

@ $z = 480'$ $\Delta q_v = 0.8(6570) = 5260$ psf ✓

@ $z = 635'$ $\Delta q_v = 0.7(6570) = 4600$ psf ✓

@ $z = 804'$ $\Delta q_v = 0.6(6570) = 3940$ psf ✓

@ $z = 1010'$ $\Delta q_v = 0.5(6570) = 3285$ psf ✓

@ $z = 1340$ $\Delta q_v = 0.4(6570) = 2630$ psf ✓

@ $z = 1855$ $\Delta q_v = 0.3(6570) = 1970$ psf ✓

@ $z = 2835$ $\Delta q_v = 0.2(6570) = 1310$ psf ✓

Project: SPSA CELL VII
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LOADS @ CENTER OF LF CELL AND AT DEPTH BELOW LINER

$X/a = 0$ (Fig. 8.7 of REF Ⓐ)

SECTION B, PT. 4 $a = 375'$ $\Delta q_{s_{z=0}} = 6300$ psf

$\frac{z}{a}$ @ $X_1 = \frac{13}{375} = .035$ $\frac{\Delta q_v}{\Delta q_s} = 0.997$ ∴ $\Delta q_{v_{x1}} = .997(6300) = 6280$ psf

$X_2 = \frac{34.75}{375} = .093$ " $= 0.991$ ∴ $\Delta q_{v_{x2}} = .991(6300) = 6245$ psf

$X_3 = \frac{45.5}{375} = 0.121$ " $= 0.989$ ∴ $\Delta q_{v_{x3}} = .989(6300) = 6230$ psf

$X_4 = \frac{52.25}{375} = 0.139$ " $= 0.987$ ∴ $\Delta q_{v_{x4}} = .987(6300) = 6220$ psf

@ $Z = 200'$ $\Delta q_v = 0.95(6300) = 5985$ psf

@ $Z = 280$ $\Delta q_v = 0.9(6300) = 5670$ psf

@ $Z = 395$ $\Delta q_v = 0.8(6300) = 5040$ psf

@ $Z = 520$ $\Delta q_v = 0.7(6300) = 4410$ psf

@ $Z = 660$ $\Delta q_v = 0.6(6300) = 3780$ psf

@ $Z = 830$ $\Delta q_v = 0.5(6300) = 3150$ psf

@ $Z = 1100'$ $\Delta q_v = 0.4(6300) = 2520$ psf

@ $Z = 1530$ $\Delta q_v = 0.3(6300) = 1890$ psf

@ $Z = 2340$ $\Delta q_v = 0.2(6300) = 1260$ psf

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LOADS @ EDGE OF LF CELL & AT DEPTH BELOW SURFACE

SECTION A POINT 1A $X/a = 1$ $X = 455'$ $a = 455'$ $\Delta q_{s_A} = 6570$ psf

(See Fig 8.7 Ref Ⓐ)

@ Z = 15' $\frac{\Delta q_v}{\Delta q_s} = 0.90$ $\Delta q_v = 0.9(6570\text{ psf}) = 5910$ psf ✓

@ Z = 48. $\frac{\Delta q_v}{\Delta q_s} = 0.80$ ✓ $\Delta q_v = 0.8(6570\text{ psf}) = 5260$ psf ✓

@ Z = 270' $\frac{\Delta q_v}{\Delta q_s} = 0.7$ ✓ $\Delta q_v = 0.7(6570\text{ psf}) = 4600$ psf ✓

@ Z = 540 $\frac{\Delta q_v}{\Delta q_s} = 0.6$ ✓ $\Delta q_v = 0.6(6570) = 3940$ psf ✓

@ Z = 800 $\frac{\Delta q_v}{\Delta q_s} = 0.5$ ✓ $\Delta q_v = 0.5(6570) = 3285$ psf ✓

@ Z = 1180 $\frac{\Delta q_v}{\Delta q_s} = 0.4$ ✓ $\Delta q_v = 0.4(6570) = 2628$ psf ✓

@ Z = 1740 $\Delta q_s = 1970$ psf ✓ @ Z = 2760 $\Delta q_v = 1300$ psf ✓

SECTION B POINTS 1B $X = 375$ $a = 375$ $\Delta q_v = 6300$ psf
$X/a = 1$

@ Z = 12' $\Delta q_v = .9(6300) = 5670$ psf ✓ @ Z = 40' $\Delta q_v = 5040$ psf ✓

@ Z = 220 $\Delta q_v = 4410$ psf ✓ @ Z = 445 $\Delta q_v = 3780$ psf ✓ @ Z = 660 $\Delta q_v = 3150$ psf ✓

@ Z = 970 $\Delta q_v = 2520$ ✓ @ Z = 1430' $\Delta q_v = 1890$ ✓

@ Z = 2270 $\Delta q_v = 1260$ psf ✓

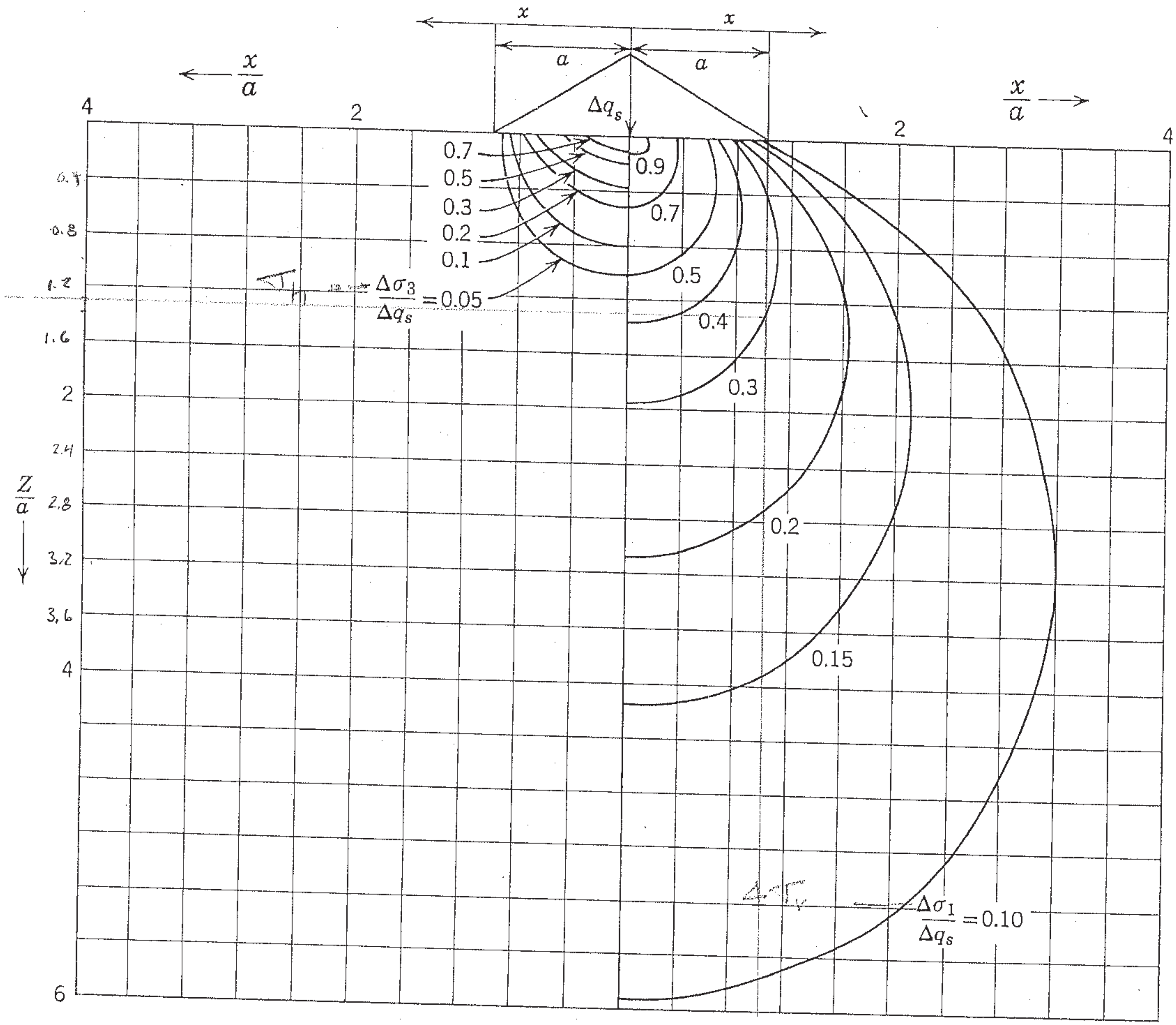

Fig. 8.8 Principal stresses under triangular strip load.

7a

Project:	SPSA – CELL VII	Computed:	TFH	Date:	JULY, 2008
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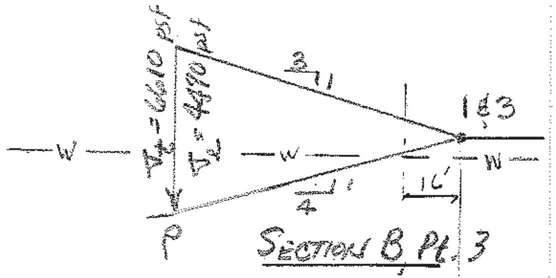
SEE FIGURE 8.8 REF Ⓐ



SECTION B Pt. 3

$\Delta q_s = 4470$ psf ✓

SECTION A Pt. 1

$X/a = 1$

$2a = 1300 - 910 = 390$

$a = 195'$ ✓

@ Z=15'	$\frac{\Delta q_v}{\Delta q_s} = 0.15$ ✓	$\Delta q_v = 0.15(4470) = 670$ psf ✓✓	@ Z=15
@ Z=34	$\frac{\Delta q_v}{\Delta q_s} = 0.20$ ✓	$\Delta q_s = 0.2(4470) = 890$ psf ✓✓	@ Z=35'
@ Z=78'	$\frac{\Delta q_v}{\Delta q_s} = 0.3$ ✓	$\Delta q_s = 0.3(4470) = 1340$ psf ✓✓	@ Z=80'
@ Z=156	$\frac{\Delta q_v}{\Delta q_s} = 0.327$ ✓✓	$\Delta q_s = 0.327(4470) = 1460$ psf ✓✓	@ Z=160
@ Z=255	$\Delta q_s = 1340$ psf ✓✓		@ Z=260
@ Z=540	$\Delta q_s = 890$ psf ✓✓		@ Z=550
@ Z=760	$\Delta q_s = 670$ psf ✓✓		@ Z=780

Z

CONSOLIDATION TEST @ Z=15' = See BORING OW3, S-2

σ_{final} = OVERBURDEN PRESSURE + 670 psf

σ_{elev+6} + 670 psf

CONSOLIDATION TEST @ Z=34 SEE BORING OW2 S-3

σ_{final} = OVERBURDEN PRESSURE + 890 psf

$\sigma_{El.-16}$

HDR | ONE COMPANY *Many Solutions*℠

Project: SPSA ~ CELL VII		Computed: TFH	Date: AUGUST, 2008
Subject: SETTLEMENT ANALYSIS		Checked: DES	Date: 8/19/08
Task: FOUNDATION LOADS		Page: 9	of:
Job #: SECTION C, POINTS 5&6		No:	

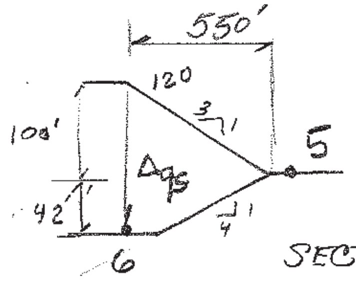
See page 2

$a = 550'$

$\sigma_{t_{\text{fill to 120}}} = 2678 + 100\,(62.4) = 8918\,\text{psf}$

$\sigma_{t_{\text{eff.}}} = 8918 - 2140 = 6778\,\text{psf}$

$\Delta q_s = 6778 - 2770 = \underline{4010\,\text{psf}}$ 2770 psf = σ_0 before exc.



SECTION C

REF Ⓐ Figure 8.8 <u>CENTER OF TRIANGULAR STRIP LOAD</u>, <u>POINT 6</u>

$X/a = 0$ $X/a = 0$

@ $Z = 66'$ $\dfrac{\Delta q_v}{\Delta q_s} = 0.9$ $\Delta q_v = 0.9\,(4010\,\text{psf}) = 3610\,\text{psf}$

@ $Z = 278$ $\dfrac{\Delta q_v}{\Delta q_s} = 0.7$ $\Delta q_v = 0.7\,(4010) = 2810\,\text{psf}$

@ $Z = 559$ $\dfrac{\Delta q_v}{\Delta q_s} = 0.5$ $\Delta q_v = 0.5\,(4010) = 2005\,\text{psf}$

@ $Z = 755$ $\Delta q_v = 0.4\,(4010) = 1604\,\text{psf}$ @ $Z = 1076'$ $\Delta q_v = 0.3\,(4010) = 1203\,\text{psf}$

<u>POINT 5</u> $X/a = 1$

@ $Z = 42'$ $\dfrac{\Delta q_v}{\Delta q_s} = 0.15$ $\Delta q_v = 0.15\,(4010) = 600\,\text{psf}$

@ $Z = 96'$ $\Delta q_v = 0.2\,(4010) = 800\,\text{psf}$ @ $Z = 220'$ $\Delta q_v = 0.3\,(4010) = 1200\,\text{psf}$

@ $Z = 440'$ $\Delta q_v = 0.327\,(4010) = 1310\,\text{psf}$ @ $Z = 720$ $\Delta q_v = 1200\,\text{psf}$

@ $Z = 1520'$ $\Delta q_v = 800\,\text{psf}$

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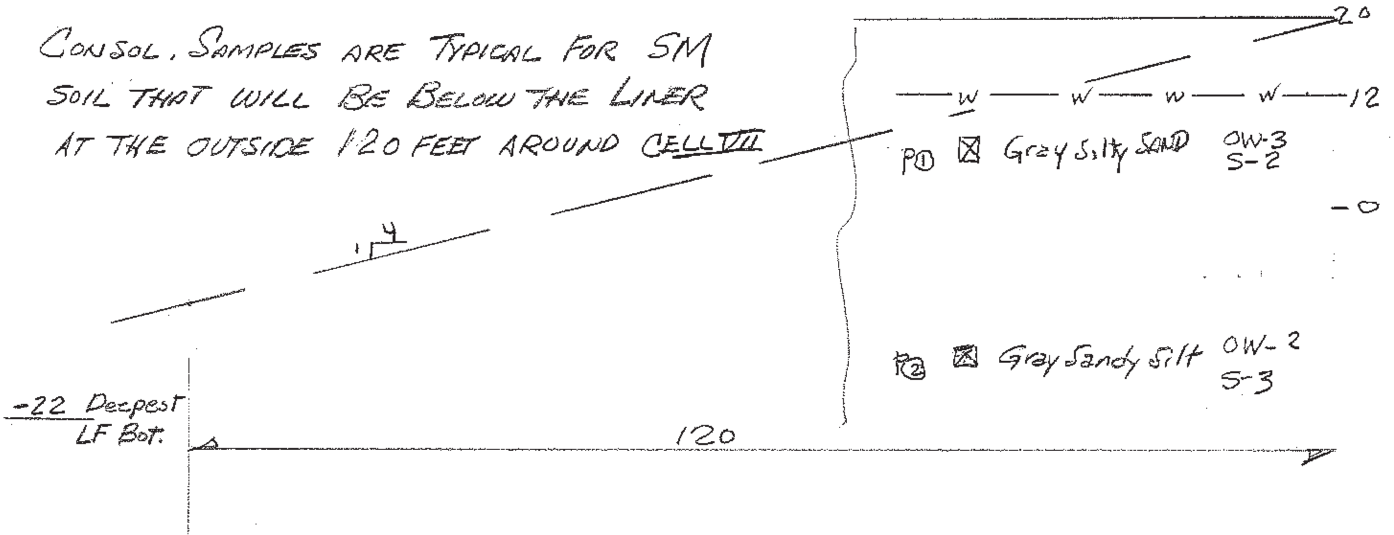
Project:	SPSA - CELL VII	Computed:	TFH	Date:	JULY, 2008
Subject:	SETTLEMENT ANALYSIS	Checked:	DES	Date:	8/14/08
Task:	FOUNDATION LOADS @	Page:	10	of:	
Job #:	CONSOLIDATION SAMPLES	No:			

CONSOL. SAMPLES ARE TYPICAL FOR SM SOIL THAT WILL BE BELOW THE LINER AT THE OUTSIDE 120 FEET AROUND CELL VII



OVERBURDEN PRESSURE Section A & B POINTS 1 & 3 (See Page 8)

P① $\sigma_{El\,6} = 114(3.6) + 112(4.4) + [(112-63)5.8] = 1187$ ~ SAY 1190 psf (0.6 tsf)

$P_{final\,+6} = 1190 + 670 = 1860$ psf (0.93 tsf)

P② $\sigma_{El\,-16} = 1187 + (115-63)10 + (118-63)3 + (124-63)7.5 + (118-63)1.5$

$= 2412$ psf SAY 2420 psf (1.2 tsf)

$P_{final\,-16} = 2420 + 890 = 3310$ psf (1.65 tsf)

See e log P curves TOP LAYER G.S. → Z = 26 $H_1 = 26'$

Bottom Z = 26 Z = 70 $H_2 = 44'$

$$S_① = \frac{\Delta e}{1+e_0} H_1 = \frac{(0.661-0.652)}{1.661}(26')\cdot 12 = 1.7''$$

$$S_② = \frac{(0.998-0.987)}{1.998}(44)\,12 = 2.9''$$

$\Delta S = 1.7 + 2.9 = 4.6''$ (G.S. to Z=70') ADD SETTLEMENT FROM YORKTOWN AQUIFER & UNDERLYING FORMATIONS

Note: 70 ft = 21.3 meters

geotechnics

ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	HDR RALEIGH	Boring	OW-3
Client Reference	SPSA	Depth (ft)	13.7 - 13.9
Project No.	2008-592-01	Sample No.	2
Lab ID	2008-592-01-02	Visual Description	GRAY SILTY SAND

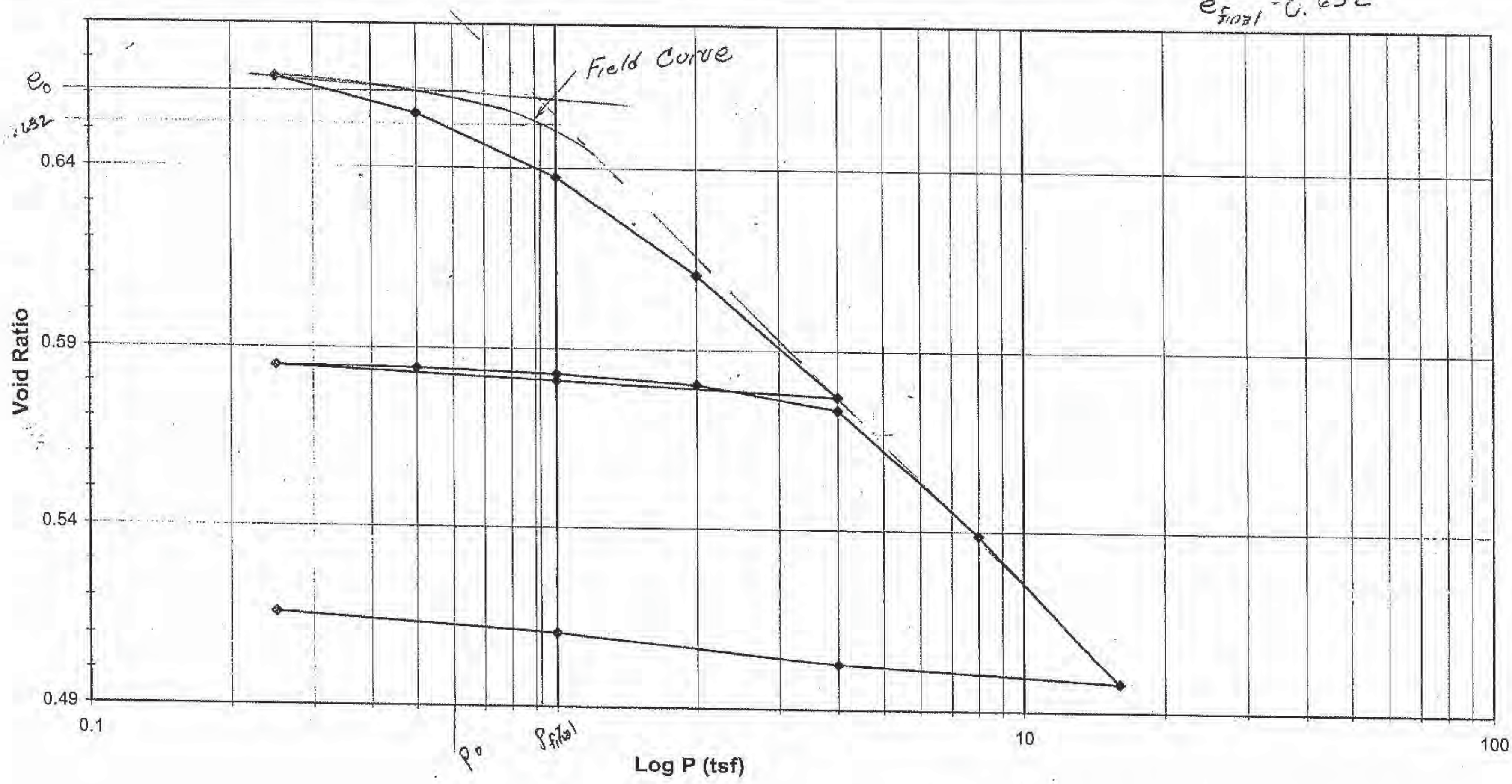
Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED

$\sigma'_{13.8} = 1190$ psf $= 0.6$ tsf

$\sigma'_{final} = (1190 + 670) = 1860$ psf $= 0.93$

$e_0 = 0.661$

$e_{final} = 0.652$



10a

Tested By JBD Date 6/30/08 Approved By Date 7-8-08

geotechnics

ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	HDR RALEIGH	Boring	OW-2
Client Reference	SPSA	Depth (ft)	35.7 - 35.9
Project No.	2008-592-01	Sample No.	3
Lab ID	2008-592-01-03	Visual Description	GRAY SANDY SILT

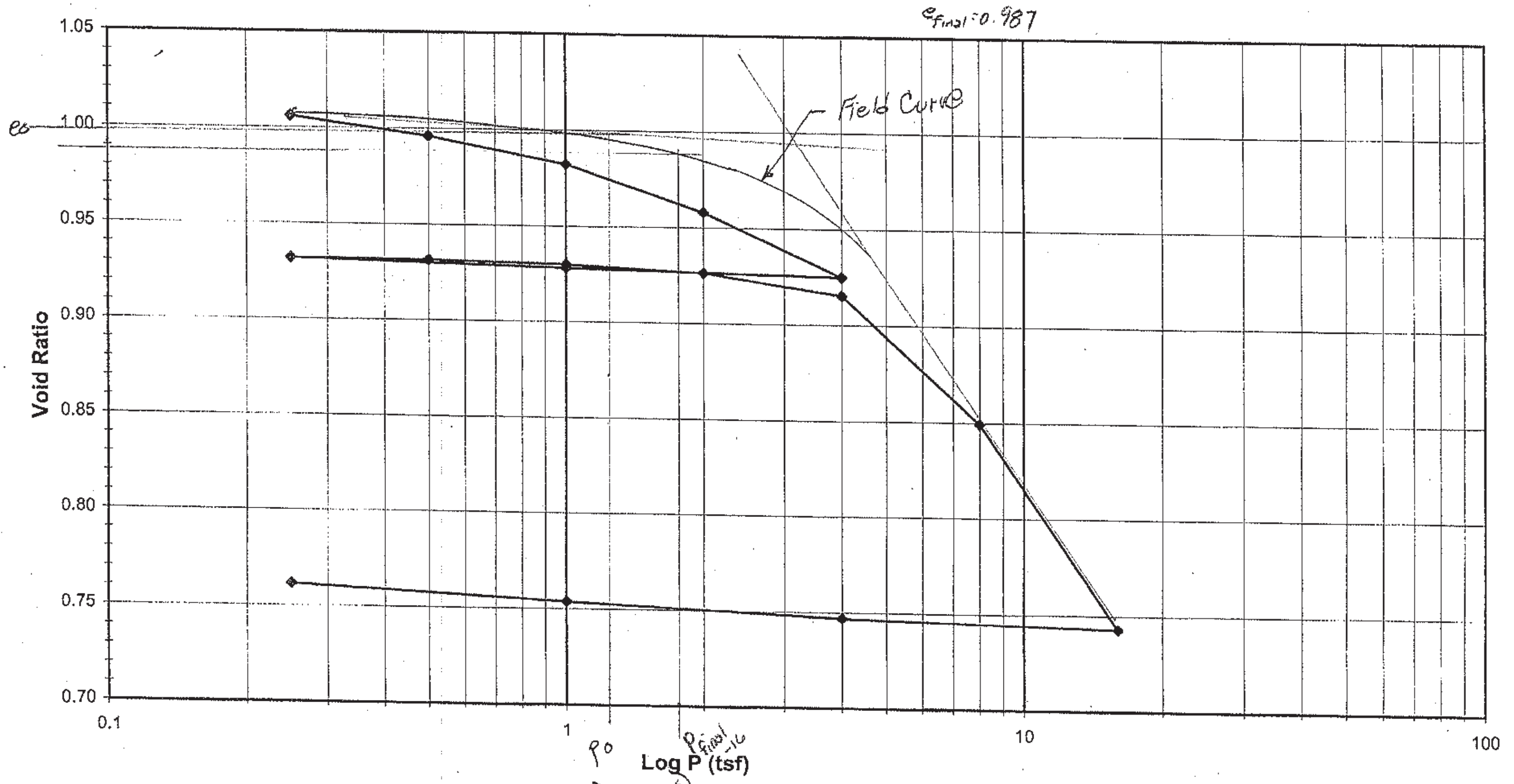
P_o: 1.2 tsf

P_{final} 1.65 tsf

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED

e_o = 0.998

e_{final} = 0.987



10b

Tested By JBD Date 06/23/08 Approved By MM Date 7-14-08

Project: SPSA - CELL VIII Computed: TFH Date: JULY, 2008
Subject: SETTLEMENT ANALYSIS Checked: DES Date: 8/19/08
Task: Δ_s FROM DILATOMETER TEST Page: 11 of:
Job #: SECTION A POINT 1 cont'd No:

REF ① DMT RESULTS P-1 & P-3

REF ② Schmertman 1988, VOL 3 "Guidelines for using the CPT, CPTU & DMT for Geotechnical Design"

REF ① P-1

$$M_{AVG} = \frac{3(270)+2(430)+6(420)}{11}$$

$= 380\,tsf$

P-3

$$M_{AVG} = \frac{5(470)+2(775)+4(626)}{11}$$

$= 582\,tsf$

REF ② p 4.42 EQ 4.27 For Drained Young's Modulus E for Δ_s total

$$M = \frac{E(1-\nu')}{(1+\nu')(1-2\nu')} \rightarrow E = \frac{M(1+\nu')(1-2\nu')}{(1-\nu')}$$

@ P-1 $\nu' = 0.3$ (clay/sand) for drained poisson's ratio

$$E = 380 \frac{(1.3)(1-2(0.3))}{1-0.3} = \underline{283\,tsf} \checkmark = E_{(SECT\ A\ CENTER)}\ POINT\ 2$$

@ P-3 $\nu = 0.3$ (clay sand)

$$E = 582 \frac{(1.3)0.4}{0.7} = \underline{432\,tsf} \checkmark = E_{(SECTION\ A\ EDGE)}\ POINT\ 1$$

POINT 1 EDGE (cont'd page 9)

ELASTICITY THEORY $\Delta q_s = 1400\,psf = 0.7\,tsf$ (see page 8, $z = 100'$)

$z = 70-100'$

$$\Delta S = \frac{\Delta q_s(H)}{E} = \frac{0.7(30ft)}{432} = 0.049' = 0.58'' \text{ Say } 0.6'' \checkmark$$

$z = 100-200$

$\Delta q_s = 1460\,psf = 0.73\,tsf$

$$\Delta_s = \frac{\Delta q_s(H)}{E} = \frac{0.73(100\,ft)}{432} = 0.169 = 2.0'' \checkmark$$

YORKTOWN FORMATION SETTLEMENT (0-200 FT)

$$\Delta_s = 1.7 + 2.9 + 0.6 + 2.0 = \underline{\underline{7.2''}}$$

HDR ONE COMPANY *Many Solutions™*

Project: SPSA - CELL VII		Computed: TFH	Date: JULY, 2008
Subject: SETTLEMENT ANALYSIS		Checked: DES	Date: 8/19/08
Task: Δ_s from WELL ~W-2106		Page: 12	of:
Job #: SECTION A POINT 1		No:	

SECTION A, POINT 1   CALVERT FORMATION (Silty to Sandy, Clay)(200-300')

$M = 818$ tsf $E = M \dfrac{(1+\nu')(1-2\nu')}{(1-\nu')}$

(P-3 74 to 84')

$\nu' = 0.4$ clay

$E = 818 \dfrac{1.4(1-2(0.4))}{(1-0.4)} = 382$ tsf ✓

$\Delta_s = \dfrac{\Delta q_s\ (H)}{E}$ @ $Z = 250$ $\Delta q_s = 1340$ psf (Sheet 8) ✓

$= 0.67$ tsf

$\dfrac{0.67\text{ tsf}\ (100)}{382} = 0.175$ ft $=$ 2.1"   Calvert Formation ✓

MATTAPONI FORMATION & TRANSITIONAL BEDS (300-500')

(300-400)
SAND w/trace of clay   P-3   4-7 meters (13-23ft)

$M = 1527$ tsf

$\nu' = 0.2$ SAND

$E = 1527 \dfrac{(1.2)(1-2(0.2))}{(1-0.2)} = 1374$ tsf ✓

$\Delta_s = \dfrac{\Delta q_s\ (H)}{E}$ $\Delta q_s @ Z = 350 = 1190$ psf ✓

$= 0.595$ tsf

$= \dfrac{0.595\,(100)}{1374} = 0.04' = $ 0.5" ✓

(400-500) Silty Sandy Clay   P-3   93'-100' $M = 385$ tsf $\nu' = 0.4$

$E = M \dfrac{(1+\nu')(1-2\nu')}{(1-\nu')} = 385 \dfrac{1.4(0.2)}{0.6} = 180$ tsf ✓

$\Delta_s = \dfrac{\Delta q_s\ (H)}{E}$ $\Delta q_{s\,@Z=450} = 1030$ psf ✓ $= 0.515$ tsf

$= \dfrac{0.515\,(100)}{180} = 0.286 = 3.4$ ✓   4.0" ✓ MATTAPONI FORM.

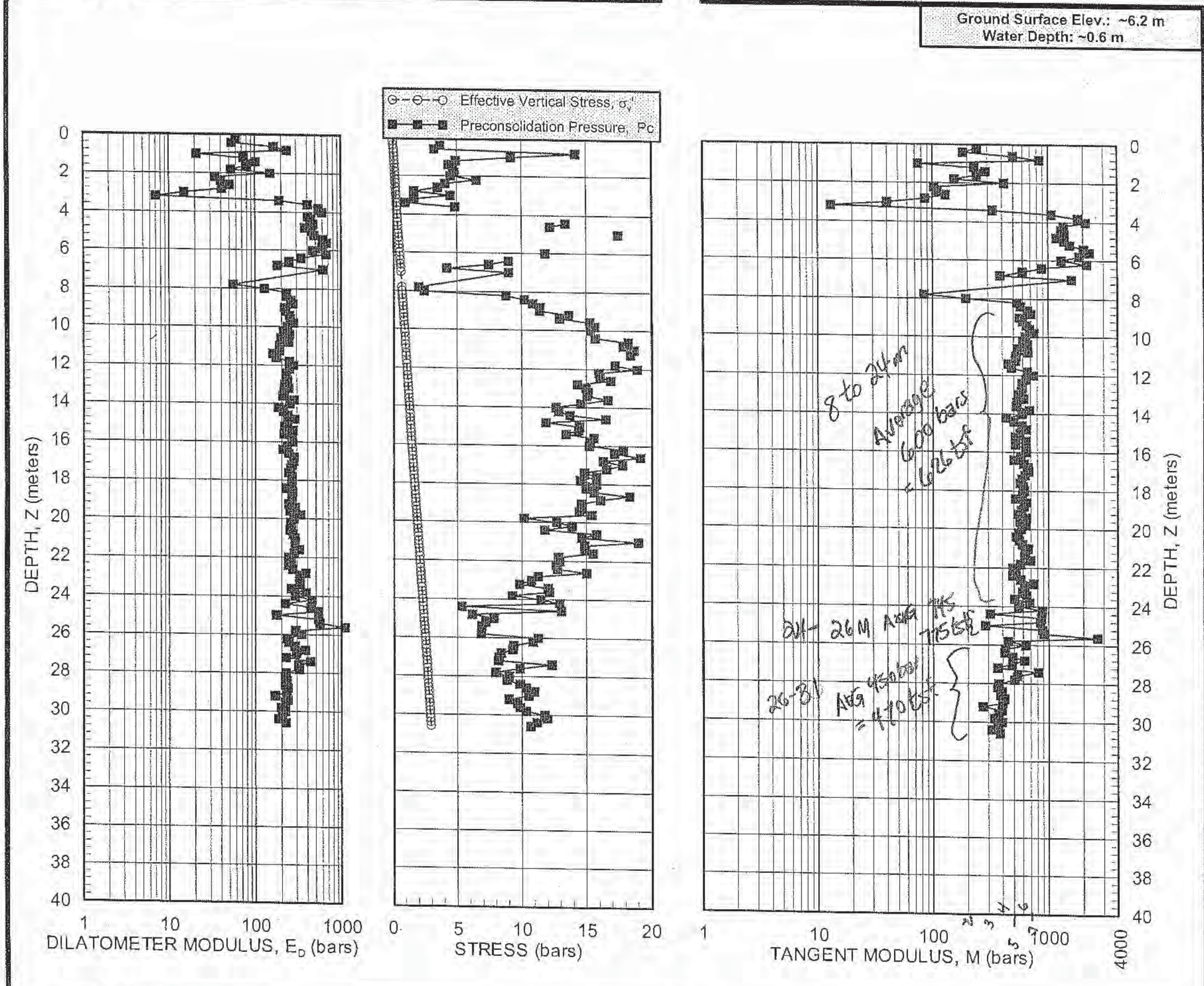
12a

PROJECT: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 5/1/07

SOUNDING
P-3

INTERPRETED DMT DEFORMATION PARAMETERS



304.8

(465.8)

126

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)    SNDG. NO. : P-3
In-Situ Soil Testing, L.C.                                                          Page 1b
JOB FILE: Suffolk Regional Landfill                                                 FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                        SNDG. DATE: 05/01/07
ANAL.BY : Roger Failmezger                                                          ANAL. DATE: 05/05/07

A  .SIS PARAMETERS:  LO RANGE    =  8.50 BARS  ROD DIAM.     =   4.4 CM    BL.THICK.   =  15.0 MM    SU  FACTOR = 1
SURF.ELEV.   =    6.2 M LO  GAGE 0 = -0.06 BARS  FR.RED.DIA. =   5.8 CM    BL.WIDTH    =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =    0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT. =   8.0 KGF/M DELTA-A     =  0.17 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =    0.5      DELTA-B =  0.36 BARS      M FACTOR = 1
MAX SU ID   =    0.9   SU OPTION   =      0     MIN PHI ID  =   0.9       OCR OPTION =     0         KO FACTOR  = 1
UNIT CONVERSIONS:      1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

   Z     ELEV     KD     ID    UD     ED      KO      SU     QD     PHI   SIGFF   PHIO    PC     OCR      M     SOIL TYPE
  (M)    (M)                        (BAR)          (BAR)  (BAR)  (DEG)  (BAR)   (DEG)  (BAR)          (BAR)
 ***** ****** ***** ***** ***** ******  *****   *****  *****  *****  ******  *****  *****  *****  ******  ************
16 0.20   6.00  52.23  0.94           60                                                          243  SILT
  0.40   5.80  25.97  0.88           54    3.22   0.37                                 3.73   54.6    185  CLAYEY SILT
2 0.60   5.60  17.66  2.62          165    2.12          26.9   43.4    0.17   39.3   3.26   31.8    500  SILTY SAND
  0.80   5.40  32.34  1.76          234    4.01          27.4   40.0    0.19   35.7  14.17  119.7    845  SANDY SILT
  1.00   5.20  30.21  0.15           21    3.50   0.87                                 9.20   69.1     75  CLAY
4 1.20   5.00  18.99  0.76           74    2.70   0.54                                 4.92   33.5    230  CLAYEY SILT
  1.40   4.80  14.46  1.26          101    1.94          15.3   37.3    0.26   33.2   4.35   27.1    289  SANDY SILT
5.25 1.60   4.60  16.52  0.81           81    2.49   0.54                                 4.70   26.9    242  CLAYEY SILT
6 1.80   4.40  15.95  0.51           53    2.44   0.55                                 4.80   25.5    155  SILTY CLAY
  2.00   4.20  13.30  1.60          150    1.77          22.6   38.4    0.33   34.9   4.51   22.2    416  SANDY SILT
  2.20   4.00  17.68  0.25           34    2.59   0.73                                 6.52   30.0    103  CLAY
8 2.40   3.80  12.57  0.40           40    2.12   0.51                                 4.07   17.6    110  SILTY CLAY
  2.60   3.60  10.96  0.54           50    1.95   0.45                                 3.48   14.2    129  SILTY CLAY
  2.80   3.40   6.62  0.69           41    1.41   0.25                                 1.67    6.5     86  CLAYEY SILT
10 3.00   3.20  12.11  0.13           15    2.07   0.56                                 4.47   16.6     40  CLAY
  3.20   3.00   6.33  0.11            7    1.37   0.26                                 1.69    6.0     13  MUD
11 3.40   2.80   4.21  4.42          189    0.75          15.4   35.8    0.46   32.7   0.98    3.3    331  SAND
  3.60   2.60  11.62  3.23          404    1.49          50.5   40.9    0.51   38.3   4.85   15.7   1068  SILTY SAND
  3.80   2.40  24.40  1.95          542    3.00          92.6   41.6    0.55   39.1  21.20   64.5   1812  SILTY SAND
13 4.00   2.20  29.83  1.66          600    3.72          81.8   39.8    0.57   37.4  35.85  102.7   2121  SANDY SILT
  4.20   2.00  24.67  1.29          407    3.14          57.4   38.3    0.60   35.8  27.59   74.7   1365  SANDY SILT
  4.40   1.80  17.21  1.87          433    2.19          66.8   40.0    0.64   37.7  13.39   34.5   1306  SILTY SAND
15 4.60   1.60  15.95  2.10          473    2.05          65.8   39.9    0.67   37.7  12.20   29.9   1393  SILTY SAND
  4.80   1.40  20.00  1.27          376    2.57          62.2   38.6    0.69   36.4  20.80   48.7   1187  SANDY SILT
  5.00   1.20  17.76  1.65          454    2.31          56.5   38.2    0.72   36.0  17.45   39.1   1383  SANDY SILT
17 5.20   1.00  20.94  1.43          483    2.65          86.0   39.8    0.76   37.7  23.81   51.1   1547  SANDY SILT
  5.40   0.80  24.24  1.49          609    3.04         100.0   39.8    0.80   37.9  33.13   68.0   2034  SANDY SILT
         0.60  25.95  1.46          671    3.19         148.7   41.5    0.85   39.7  37.22   73.1   2284  SANDY SILT
19       0.40  18.92  1.72          600    2.40          98.0   40.1    0.87   38.3  21.94   41.4   1862  SANDY SILT
  6.00   0.20  13.56  1.80          466    1.74          90.1   40.5    0.91   38.7  11.81   21.4   1301  SANDY SILT
  6.20   0.00  21.91  1.53          666    2.74         127.8   40.7    0.94   39.0  30.86   54.1   2159  SANDY SILT
21 6.40  -0.20  11.06  1.49          338    1.48          71.9   39.3    0.97   37.6   8.99   15.2    877  SANDY SILT
  6.60  -0.40   9.47  1.23          246    1.34          50.5   37.4    0.98   35.6   7.46   12.2    601  SANDY SILT
  6.80  -0.60   6.93  1.19          180    1.00          56.0   38.5    1.02   36.9   4.20    6.7    385  SILT
23 7.00  -0.80  11.21  2.43          610    1.40         124.1   41.9    1.07   40.5   9.01   14.0   1592  SILTY SAND
  7.80  -1.60   3.89  0.57           55    0.97   0.36                                 2.01    2.8     84  SILTY CLAY
26 8.00  -1.80   3.63  1.40          128    0.81          17.4   30.2    1.09   28.4   2.45    3.4    194  SANDY SILT
27 8.20  -2.00   8.38  1.06          230    1.34          25.1   31.6    1.13   29.9   8.80   11.8    534  SILT
  8.40  -2.20  10.56  0.81          227    1.90   1.34                                10.21   13.4    578  CLAYEY SILT
  8.60  -2.40  10.80  0.88          258    1.93   1.41                                10.84   13.9    663  CLAYEY SILT
29 8.80  -2.60  11.00  0.89          272    1.95   1.48                                11.42   14.3    705  CLAYEY SILT
  9.00  -2.80  10.82  0.71          218    1.93   1.48                                11.39   13.9    560  CLAYEY SILT
  9.20  -3.00  11.98  0.65          225    2.06   1.72                                13.65   16.3    600  CLAYEY SILT
31 9.40  -3.20  11.43  0.73          247    2.00   1.66                                12.96   15.2    648  CLAYEY SILT
  9.60  -3.40  12.52  0.67          254    2.11   1.90                                15.28   17.5    689  CLAYEY SILT
  9.80  -3.60  12.54  0.71          276    2.11   1.95                                15.64   17.5    749  CLAYEY SILT
 10.00  -3.80  12.21  0.61          236    2.08   1.92                                15.32   16.8    634  CLAYEY SILT
 10.20  -4.00  14.55  0.45          210    2.31   2.45                                20.57   22.1    600  SILTY CLAY
 10.40  -4.20  12.07  0.62          247    2.06   1.98                                15.69   16.5    661  CLAYEY SILT
 10.60  -4.40  13.14  0.44          196    2.17   2.24                                18.25   18.8    540  SILTY CLAY
 10.80  -4.60  12.82  0.55          243    2.14   2.21                                17.88   18.1    665  SILTY CLAY
 11.00  -4.80  13.04  0.42          190    2.16   2.30                                18.70   18.6    523  SILTY CLAY
 11.25  -5.05  12.74  0.42          190    2.13   2.28                                18.42   18.0    519  SILTY CLAY
 11.40  -5.20  13.85  0.32          159    2.24   2.57                                21.27   20.5    447  CLAY
 11.60  -5.40  13.20  0.36          174    2.18   2.46                                20.07   19.0    480  SILTY CLAY
 11.80  -5.60  11.84  0.56          247    2.04   2.18                                17.23   16.0    656  SILTY CLAY
 12.00  -5.80  12.43  0.58          274    2.10   2.37                                18.95   17.3    741  SILTY CLAY
 12.20  -6.00  11.02  0.58          247    1.95   2.07                                15.98   14.3    639  SILTY CLAY
 12.40  -6.20  10.94  0.53          228    1.94   2.09                                16.06   14.2    591  SILTY CLAY
 12.60  -6.40  11.19  0.51          228    1.97   2.18                                16.89   14.7    595  SILTY CLAY
 12.80  -6.60   9.97  0.58          236    1.84   1.91                                14.32   12.3    589  SILTY CLAY
 13.00  -6.80  10.16  0.52          218    1.86   1.99                                14.98   12.6    547  SILTY CLAY
 13.20  -7.00  10.13  0.57          243    1.85   2.01                                15.14   12.6    611  SILTY CLAY
 13.40  -7.20  10.00  0.50          214    1.84   2.01                                15.05   12.3    535  SILTY CLAY
 13.60  -7.40  10.58  0.45          207    1.90   2.19                                16.66   13.4    528  SILTY CLAY
```

AVG = 1462 BAR = 1527 TSF

AVG = 1152 BAR = 1204 TSF

12C

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)
In-Situ Soil Testing, L.C.
JOB FILE: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew
ANAL. BY : Roger Failmezger

SNDG. NO. : P-3
Page 2b
FILE NO. :2007-25

SNDG. DATE: 05/01/07
ANAL. DATE: 05/05/07

ANALYSIS PARAMETERS: LO RANGE = 8.50 BARS ROD DIAM. = 4.4 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 6.2 M LO GAGE 0 = -0.06 BARS FR.RED.DIA. = 5.8 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 0.6 M HI GAGE 0 = 0.00 BARS LIN.ROD WT. = 8.0 KGF/M DELTA-A = 0.17 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.36 BARS M FACTOR = 1
MAX SU ID = 0.9 SU OPTION = 0 MIN PHI ID = 0.9 OCR OPTION = 0 KO FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	KO	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
*****	******	*****	*****	*****	******	*****	*****	*****	*****	******	*****	*****	*****	******	************
13.80	-7.60	9.61	0.67		279	1.79	1.97					14.56	11.6	687	CLAYEY SILT
14.00	-7.80	8.69	0.65		250	1.68	1.76					12.65	9.9	590	CLAYEY SILT
14.20	-8.00	8.70	0.47		183	1.68	1.79					12.85	9.9	431	SILTY CLAY
14.40	-8.20	9.00	0.51		210	1.72	1.89					13.73	10.4	503	SILTY CLAY
14.60	-8.40	10.03	0.51		236	1.84	2.20					16.49	12.4	590	SILTY CLAY
14.80	-8.60	8.04	0.75		283	1.60	1.70					11.87	8.8	645	CLAYEY SILT
15.00	-8.80	9.06	0.55		236	1.73	2.00					14.49	10.6	566	SILTY CLAY
15.20	-9.00	8.95	0.50		218	1.72	1.99					14.40	10.4	519	SILTY CLAY
15.40	-9.20	8.49	0.66		272	1.66	1.89					13.42	9.5	635	CLAYEY SILT
15.60	-9.40	9.26	0.47		214	1.75	2.13					15.58	10.9	518	SILTY CLAY
15.80	-9.60	9.08	0.58		265	1.73	2.11					15.30	10.6	636	SILTY CLAY
16.00	-9.80	8.97	0.59		270	1.72	2.10					15.22	10.4	646	SILTY CLAY
16.20	-10.00	9.84	0.46		232	1.82	2.40					17.84	12.0	576	SILTY CLAY
16.40	-10.20	9.52	0.42		207	1.78	2.33					17.17	11.4	506	SILTY CLAY
16.60	-10.40	10.13	0.45		243	1.85	2.55					19.18	12.6	610	SILTY CLAY
16.80	-10.60	9.04	0.57		278	1.73	2.25					16.30	10.5	666	SILTY CLAY
17.00	-10.80	9.49	0.53		276	1.78	2.42					17.79	11.3	675	SILTY CLAY
17.20	-11.00	8.99	0.53		261	1.72	2.29					16.57	10.4	625	SILTY CLAY
17.40	-11.20	8.31	0.55		254	1.64	2.10					14.84	9.2	587	SILTY CLAY
17.60	-11.40	8.57	0.50		243	1.67	2.21					15.77	9.7	569	SILTY CLAY
17.80	-11.60	8.07	0.57		265	1.61	2.08					14.54	8.8	604	SILTY CLAY
18.00	-11.80	8.44	0.54		265	1.65	2.22					15.78	9.4	616	SILTY CLAY
18.20	-12.00	8.09	0.55		259	1.61	2.14					14.97	8.8	592	SILTY CLAY
18.40	-12.20	8.24	0.46		225	1.63	2.21					15.60	9.1	517	SILTY CLAY
18.60	-12.40	9.08	0.49		269	1.73	2.53					18.35	10.6	645	SILTY CLAY
18.80	-12.60	8.28	0.53		265	1.63	2.28					16.09	9.2	611	SILTY CLAY
19.[illegible]	-12.80	7.72	0.55		261	1.56	2.11					14.60	8.2	584	SILTY CLAY
[illegible]	-13.00	7.69	0.51		243	1.56	2.13					14.68	8.2	542	SILTY CLAY
19.[illegible]	-13.20	7.56	0.61		290	1.54	2.11					14.45	8.0	643	CLAYEY SILT
19.60	-13.40	7.82	0.50		250	1.57	2.22					15.41	8.4	563	SILTY CLAY
19.80	-13.60	5.59	0.92		332	0.95		82.5	34.2	2.90	34.3	10.17	5.5	637	SILT
20.00	-13.80	6.81	0.62		276	1.44	1.91					12.70	6.8	581	CLAYEY SILT
20.20	-14.00	7.16	0.54		254	1.49	2.06					13.89	7.3	548	SILTY CLAY
20.40	-14.20	6.40	0.60		258	1.38	1.81					11.77	6.1	526	CLAYEY SILT
20.60	-14.40	7.67	0.49		250	1.55	2.29					15.78	8.1	558	SILTY CLAY
20.80	-14.60	7.26	0.55		272	1.50	2.16					14.63	7.5	591	SILTY CLAY
21.00	-14.80	8.53	0.49		285	1.66	2.67					19.01	9.6	666	SILTY CLAY
21.20	-15.00	7.23	0.58		290	1.49	2.19					14.84	7.4	629	SILTY CLAY
21.40	-15.20	7.20	0.57		287	1.49	2.20					14.89	7.4	620	SILTY CLAY
21.60	-15.40	7.34	0.62		320	1.51	2.28					15.50	7.6	697	CLAYEY SILT
21.80	-15.60	6.45	0.61		279	1.39	1.96					12.82	6.2	573	CLAYEY SILT
22.00	-15.80	6.45	0.51		239	1.39	1.98					12.95	6.2	491	SILTY CLAY
22.20	-16.00	6.32	0.56		258	1.37	1.95					12.66	6.0	523	SILTY CLAY
22.40	-16.20	6.31	0.51		239	1.36	1.96					12.75	6.0	485	SILTY CLAY
22.60	-16.40	6.96	0.52		269	1.46	2.25					15.03	7.0	572	SILTY CLAY
22.80	-16.60	5.75	0.88		381	1.28	1.79					11.27	5.2	742	CLAYEY SILT
23.00	-16.80	5.54	0.78		327	1.25	1.72					10.73	4.9	621	CLAYEY SILT
23.20	-17.00	5.21	0.81		323	1.20	1.61					9.83	4.5	595	CLAYEY SILT
23.40	-17.20	5.89	0.72		329	1.30	1.89					12.02	5.4	644	CLAYEY SILT
23.60	-17.40	5.89	0.56		259	1.30	1.91					12.13	5.4	508	SILTY CLAY
23.80	-17.60	4.87	1.00		383	0.81		134.0	36.4	3.62	36.8	9.25	4.1	683	SILT
24.00	-17.80	5.61	0.65		290	1.26	1.83					11.47	5.0	554	CLAYEY SILT
24.20	-18.00	5.76	0.97		451	0.95		117.5	35.1	3.65	35.6	12.92	5.6	878	SILT
24.40	-18.20	3.39	0.80		221	0.87	1.00					5.33	2.3	311	CLAYEY SILT
24.60	-18.40	5.99	0.89		436	1.32	2.04					13.05	5.5	865	CLAYEY SILT
24.80	-18.60	3.81	1.71		538	0.64		169.3	38.0	3.84	38.5	6.13	2.6	850	SANDY SILT
25.00	-18.80	4.27	0.49		174	1.03	1.36					7.83	3.3	283	SILTY CLAY
25.20	-19.00	4.10	1.56		538	0.69		160.8	37.4	3.89	38.0	7.19	3.0	884	SANDY SILT
25.40	-19.20	4.09	1.60		553	0.67		186.0	38.4	3.95	38.9	6.87	2.8	907	SANDY SILT
25.60	-19.40	9.27	1.37		1088	1.35		164.9	36.0	3.91	36.6	30.28	12.3	2641	SANDY SILT
25.80	-19.60	3.83	0.88		290	0.95	1.23					6.83	2.8	445	CLAYEY SILT
26.00	-19.80	5.24	0.75		341	1.20	1.83					11.24	4.5	630	CLAYEY SILT
26.20	-20.00	5.09	0.52		232	1.18	1.78					10.84	4.3	420	SILTY CLAY
26.40	-20.20	4.61	0.60		243	1.10	1.59					9.34	3.7	415	SILTY CLAY
26.60	-20.40	4.57	0.70		285	1.09	1.58					9.27	3.6	485	CLAYEY SILT

Avg = 784 bar = 818 TSF

12d

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)     SNDG. NO. : P-3
In-Situ Soil Testing, L.C.                                                           Page 3b
JOB FILE: Suffolk Regional Landfill                                                  FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                         SNDG. DATE: 05/01/07
ANAL.BY : Roger Failmezger                                                           ANAL. DATE: 05/05/07

ANALYSIS PARAMETERS: LO RANGE   =  8.50 BARS  ROD DIAM.    =    4.4 CM     BL.THICK.  =  15.0 MM     SU  FACTOR = 1
SURF.ELEV.  =    6.2 M LO  GAGE 0 = -0.06 BARS  FR.RED.DIA. =    5.8 CM     BL.WIDTH   =  96.0 MM     PHI FACTOR = 1
WATER DEPTH =    0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT. =    8.0 KGF/M DELTA-A    =  0.17 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =    0.5       DELTA-B =  0.36 BARS     M FACTOR = 1
MAX SU ID   =    0.9   SU OPTION  =     0       MIN PHI ID  =    0.9       OCR OPTION =      0       K0 FACTOR  = 1
UNIT CONVERSIONS:      1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

    Z     ELEV     KD    ID    UD    ED     K0     SU     QD    PHI   SIGFF   PHIO    PC    OCR     M     SOIL TYPE
   (M)    (M)                       (BAR)         (BAR)  (BAR)  (DEG)  (BAR)  (DEG)  (BAR)        (BAR)
 ***** ******   ***** ***** ***** ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************
88 26.80 -20.60   4.18  1.01          378   0.74          142.6   36.1    4.10   36.8   8.39    3.3     616  SILT
   27.00 -20.80   4.19  0.79          298   1.02   1.44                                8.22    3.2     482  CLAYEY SILT
   27.20 -21.00   4.15  0.60          225   1.01   1.43                                8.16    3.1     359  SILTY CLAY
90 27.40 -21.20   5.37  0.88          432   1.22   1.99                               12.30    4.7     810  CLAYEY SILT
   27.60 -21.40   4.63  0.73          312   1.10   1.67                                9.83    3.7     536  CLAYEY SILT
   27.80 -21.60   4.02  0.86          320   0.99   1.41                                7.96    3.0     505  CLAYEY SILT
92 28.00 -21.80   4.33  0.56          225   1.05   1.56                                9.00    3.3     369  SILTY CLAY
   28.20 -22.00   4.26  0.55          221   1.03   1.54                                8.83    3.3     360  SILTY CLAY
   28.40 -22.20   4.55  0.54          232   1.08   1.68                                9.84    3.6     393  SILTY CLAY
94 28.60 -22.40   4.67  0.50          221   1.10   1.74                               10.30    3.7     380  SILTY CLAY
   28.80 -22.60   4.84  0.51          236   1.13   1.84                               10.97    4.0     414  SILTY CLAY
   29.00 -22.80   4.69  0.51          230   1.11   1.78                               10.53    3.8     397  SILTY CLAY
   29.20 -23.00   4.22  0.41          167   1.03   1.57                                8.99    3.2     269  SILTY CLAY
96 29.40 -23.20   4.40  0.55          236   1.06   1.66                                9.65    3.4     391  SILTY CLAY
   29.60 -23.40   4.44  0.51          221   1.07   1.69                                9.86    3.5     369  SILTY CLAY
   29.80 -23.60   4.56  0.44          199   1.09   1.76                               10.33    3.6     338  SILTY CLAY
98 30.00 -23.80   4.93  0.45          221   1.15   1.95                               11.75    4.1     392  SILTY CLAY
   30.20 -24.00   4.96  0.41          203   1.15   1.99                               11.97    4.1     362  SILTY CLAY
   30.40 -24.20   4.73  0.39          185   1.11   1.88                               11.16    3.8     320  SILTY CLAY
100 30.60 -24.40  4.57  0.48          223   1.09   1.81                               10.66    3.6     378  SILTY CLAY
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AVG = 369 BAR = 385 TSF

Project: SPSA - CELL VII	Computed: TFH	Date: JULY, 2008	
Subject: SETTLEMENT ANALYSIS	Checked: DE8	Date: 8/19/08	
Task: Δ_s from WELL ~ W 2106	Page: 13	of:	
Job #: SECTION A POINT 1	No:		

SECTION A POINT 1   PATUXENT FORMATION (500-1000) SAND

P-3 20-24 TAN COARSE SAND
6 - 7 meters

$M_{AVG} = 1204\ tsf$

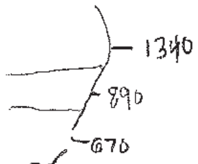
$\gamma' = 0.2$ Sand

$$E = M \frac{(1.2)(0.6)}{0.8} = 1204(0.9) = 1084\ tsf$$

@ $z = 540$ $\Delta q_s = 890$

@ $z = 760$ $\Delta q_s = 670$

$$\overline{\Delta q_s} = \frac{890(160) + 670(340)}{500} = 740\ psf = 0.37\ tsf$$



$$\Delta_s = \frac{\overline{\Delta q_s}\,(H)}{E} = \frac{0.37(500)}{1084} = 0.171 = 2.0''$$

SECTION A POINT 1

TOTAL SETTLEMENT :

7.2"	YORKTOWN
2.1"	CALVERT
4.0	MATTAPONI & TRANS. BEDS
2.0	PATUXENT
15.3"	SAY 16 INCHES

13a

PROJECT: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia

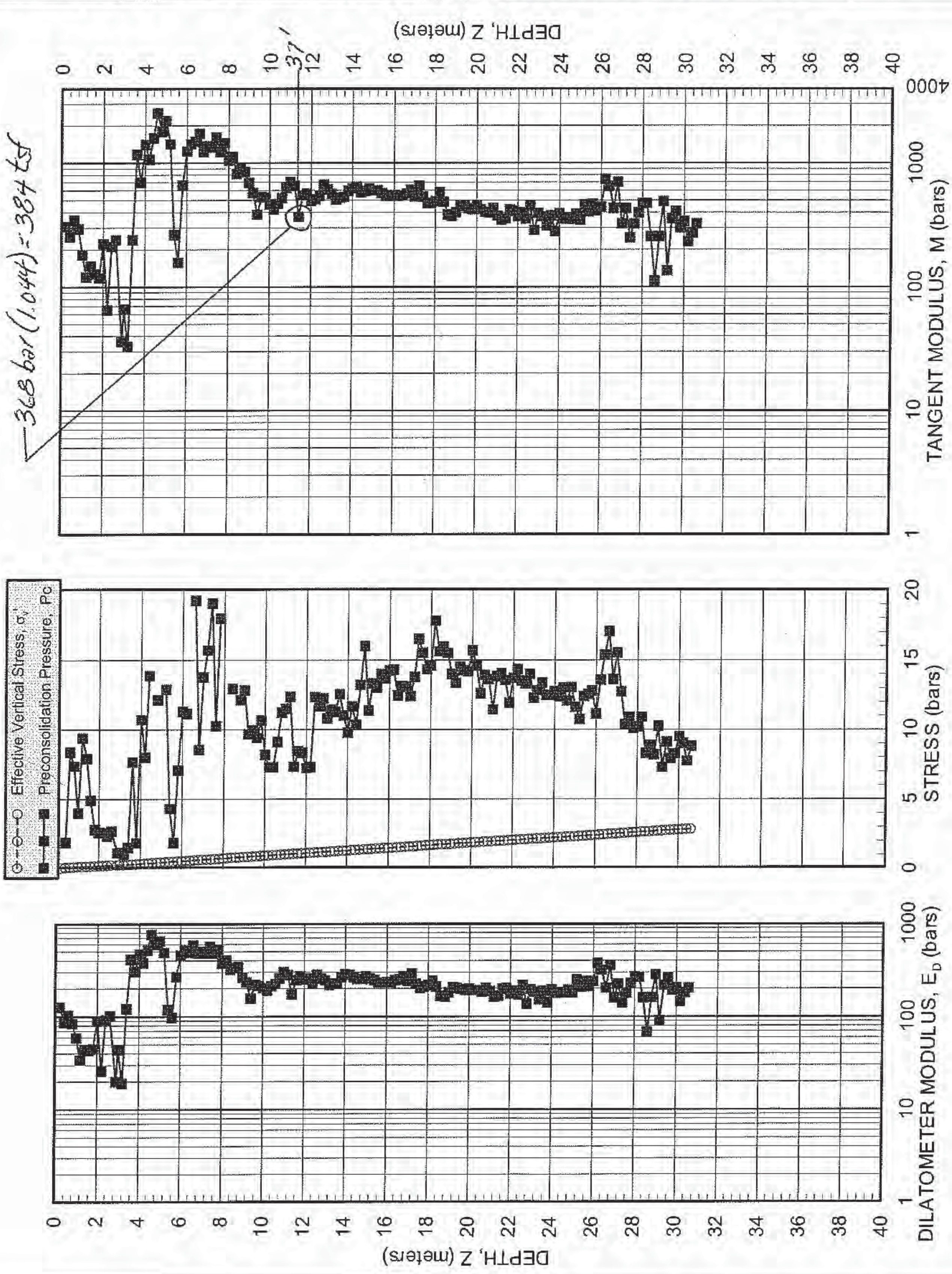
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 5/2/07

SOUNDING

P-1

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~6.5 m
Water Depth: ~0.6 m



37'

368 bar (1.044) = 384 tsf

13 b

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)      SNDG. NO. : P-1
In-Situ Soil Testing, L.C.                                                            Page 1b
JOB FILE: Suffolk Regional Landfill                                                   FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                          SNDG. DATE: 05/02/07
ANAL.BY : Roger Failmezger                                                            ANAL. DATE: 05/05/07

A    SIS PARAMETERS:  LO RANGE    =  9.00 BARS  ROD DIAM.    =   4.4 CM     BL.THICK.  =  15.0 MM    SU  FACTOR = 1
SURF.ELEV.  =    6.5 M LO  GAGE 0 = -0.06 BARS  FR.RED.DIA. =   5.8 CM     BL.WIDTH   =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =    0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT. =   8.0 KGF/M DELTA-A     =  0.17 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =   0.5       DELTA-B =  0.36 BARS      M FACTOR = 1
MAX SU ID   =   0.9   SU OPTION   =     0       MIN PHI ID  =   0.9       OCR OPTION =    0          K0 FACTOR  = 1
UNIT CONVERSIONS:     1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z     ELEV     KD     ID     UD     ED      K0     SU     QD     PHI    SIGFF   PHIO    PC     OCR      M      SOIL TYPE
 (M)    (M)                          (BAR)          (BAR)  (BAR)  (DEG)   (BAR)   (DEG)  (BAR)          (BAR)
***** ******  ***** ***** ***** ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************
 0.20   6.30   9.34 11.11           126                                                              308  SAND
 0.40   6.10  15.81  2.31            87   1.98          11.0   41.4    0.11   36.3   1.90   27.8     254  SILTY SAND
 0.60   5.90  25.05  1.17           103   3.23          10.9   36.6    0.16   31.6   8.38   82.4     347  SILT
 0.80   5.70  28.71  0.73            84   3.40   0.71                                7.37   63.8     294  CLAYEY SILT
 1.00   5.50  18.03  0.73            59   2.62   0.44                                3.99   30.9     182  CLAYEY SILT
 1.20   5.30  29.27  0.24            34   3.44   0.90                                9.40   65.8     120  CLAY
 1.40   5.10  24.71  0.33            44   3.13   0.80                                7.91   50.5     148  CLAY
 1.60   4.90  17.21  0.42            43   2.55   0.55                                4.90   28.7     128  SILTY CLAY
 1.80   4.70  11.46  0.61            45   2.00   0.36                                2.81   15.2     118  CLAYEY SILT
 2.00   4.50  10.01  1.30            89   1.38          18.7   38.1    0.32   34.5   2.60   13.2     223  SANDY SILT
 2.20   4.30   9.95  0.36            26   1.83   0.34                                2.58   12.2      65  SILTY CLAY
 2.40   4.10   8.09  1.47            92   1.27           9.4   33.3    0.35   29.3   2.35   10.5     212  SANDY SILT
 2.60   3.90   8.66  1.42           101   1.31          12.8   34.9    0.37   31.2   2.68   11.3     239  SANDY SILT
 2.90   3.60   5.18  0.43            20   1.19   0.19                                1.13    4.4      36  SILTY CLAY
 3.00   3.50   3.56  1.37            44   0.97           2.7   23.2    0.37   18.6   1.16    4.4      66  SANDY SILT
 3.20   3.30   4.63  0.44            19   1.10   0.17                                1.01    3.7      33  SILTY CLAY
 3.40   3.10   5.73  2.11           121   0.91          18.4   36.7    0.46   33.6   1.50    5.2     240  SILTY SAND
 3.60   2.90  14.72  2.63           410   1.88          51.1   40.4    0.50   37.7   7.68   25.1    1174  SILTY SAND
 3.80   2.70   7.73  3.52           306   0.87          77.1   44.3    0.55   42.0   1.85    5.7     697  SAND
 4.00   2.50  16.84  2.34           470   2.10          76.4   41.6    0.57   39.2  10.71   31.2    1406  SILTY SAND
 4.20   2.30  14.01  2.15           379   1.76          69.4   41.3    0.60   39.0   8.01   22.1    1067  SILTY SAND
 4.40   2.10  18.24  2.14           517   2.26          91.8   41.7    0.64   39.5  13.87   36.3    1587  SILTY SAND
 4.60   1.90  23.40  2.34           764   2.87         115.9   41.8    0.67   39.7  23.75   58.9    2525  SILTY SAND
 4.80   1.70  16.97  2.39           598   2.01         147.9   43.9    0.72   42.0  12.15   28.7    1794  SILTY SAND
 5.00   1.50  24.39  1.73           651   3.03         107.1   40.7    0.73   38.6  29.64   66.7    2177  SANDY SILT
 5.20   1.30  15.25  1.99           489   1.97          70.1   39.7    0.76   37.6  12.88   27.7    1418  SILTY SAND
 5      1.10   7.49  0.95           119   1.18          23.2   34.3    0.76   31.9   4.30    8.9     263  SILT
        0.90   4.07  1.38            97   0.82          14.5   31.6    0.76   29.1   1.85    3.7     158  SANDY SILT
 5      0.70   9.75  1.54           268   1.42          31.6   35.4    0.81   33.2   7.07   13.8     663  SANDY SILT
 6.00   0.50  12.77  1.93           455   1.73          51.3   37.5    0.86   35.6  11.30   21.2    1242  SILTY SAND
 6.20   0.30  12.66  2.14           520   1.69          63.0   38.6    0.90   36.7  11.13   20.1    1417  SILTY SAND
 6.40   0.10  17.67  1.40           491   2.30          76.4   38.5    0.93   36.7  21.99   38.4    1491  SANDY SILT
 6.60  -0.10  16.27  1.74           586   2.12          79.7   38.8    0.97   37.1  19.25   32.4    1734  SANDY SILT
 6.80  -0.30  10.85  2.06           477   1.41          93.4   40.6    1.02   39.1   8.55   13.9    1230  SILTY SAND
 7.00  -0.50  13.01  1.74           498   1.75          65.9   37.9    1.02   36.3  13.77   21.7    1369  SANDY SILT
 7.20  -0.70  13.57  1.56           480   1.84          61.8   37.3    1.05   35.6  15.70   24.0    1338  SANDY SILT
 7.40  -0.90  14.75  1.64           564   1.98          65.3   37.2    1.08   35.6  19.04   28.3    1616  SANDY SILT
 7.60  -1.10  10.46  1.91           482   1.47          57.8   37.1    1.11   35.6  10.26   14.8    1226  SILTY SAND
 7.80  -1.30  13.22  1.60           524   1.86          42.1   34.4    1.12   32.8  17.98   25.2    1447  SANDY SILT
 8.00  -1.50  13.86  1.05           372   1.94          44.2   34.4    1.15   32.8  20.25   27.6    1046  SILT
 8.20  -1.70  13.36  1.16           405   1.91          34.8   32.8    1.16   31.2  20.48   27.2    1124  SILT
 8.40  -1.90  10.58  1.13           320   1.56          39.1   33.9    1.20   32.4  12.93   16.7     816  SILT
 8.60  -2.10  12.80  0.96           336   1.87          30.8   31.8    1.21   30.2  20.59   26.0     918  SILT
 8.80  -2.30   9.71  1.26           343   1.48          32.0   32.5    1.24   31.0  12.12   15.0     847  SANDY SILT
 9.00  -2.50  11.58  0.79           261   2.01   1.64                               12.82   15.5     689  CLAYEY SILT
 9.20  -2.70   9.53  0.83           234   1.78   1.31                                9.67   11.4     572  CLAYEY SILT
 9.40  -2.90   9.59  0.54           156   1.79   1.35                                9.98   11.5     382  SILTY CLAY
 9.60  -3.10   9.11  0.79           221   1.73   1.29                                9.40   10.6     531  CLAYEY SILT
 9.80  -3.30   9.73  0.70           214   1.81   1.43                               10.64   11.8     529  CLAYEY SILT
10.00  -3.50   8.12  0.78           203   1.61   1.17                                8.18    8.9     464  CLAYEY SILT
10.20  -3.70   7.44  0.79           191   1.52   1.07                                7.29    7.8     421  CLAYEY SILT
10.40  -3.90   7.35  0.87           213   1.51   1.07                                7.29    7.6     467  CLAYEY SILT   LINER 1
10.60  -4.10   8.38  0.79           225   1.64   1.29                                9.12    9.3     522  CLAYEY SILT
__________________________________________________________________________________________________________________ 35
10.80  -4.30   9.47  0.79           258   1.78   1.53                               11.24   11.3     630  CLAYEY SILT
11.00  -4.50   8.42  1.02           301   1.31          42.7   33.2    1.57   32.1  11.48   11.3     702  SILT          34.8'
11.20  -4.70   8.67  0.90           279   1.34          43.0   33.0    1.59   32.0  12.36   12.0     658  SILT
11.40  -4.90   6.94  0.68           173   1.45   1.09                                7.32    7.0     368  CLAYEY SILT   (4.6')
11.60  -5.10   7.53  0.88   CLAY    247   1.53   1.23    M̄ = 590 tsf   591           8.46    7.9     546  CLAYEY SILT
11.80  -5.30   6.67  1.07           270   1.11          41.0   32.8    1.68   31.9   8.33    7.7     566  SILT
12.00  -5.50   5.90  1.10           250   1.05          34.1   31.5    1.69   30.6   7.23    6.5     493  SILT
__________________________________________________________________________________________________________________ 39.4'
12.20  -5.70   5.93  1.11           258   1.04          36.8   32.0    1.72   31.1   7.29    6.5     511  SILT
12.40  -5.90   9.18  0.62           225   1.74   1.69                               12.33   10.8     542  CLAYEY SILT
12.60  -6.10   8.78  0.80           283   1.69   1.62                               11.68   10.0     670  CLAYEY SILT
12.80  -6.30   8.95  0.70           256   1.72   1.69                               12.23   10.4     611  CLAYEY SILT
13.00  -6.50   8.18  0.72           245   1.62   1.54                               10.80    9.0     562  CLAYEY SILT
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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)
In-Situ Soil Testing, L.C.
JOB FILE: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew
A'   BY : Roger Failmezger

SNDG. NO. : P-1
Page 2b
FILE NO. :2007-25

SNDG. DATE: 05/02/07
ANAL. DATE: 05/05/07

13 C

ANALYSIS PARAMETERS: LO RANGE = 9.00 BARS ROD DIAM. = 4.4 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 6.5 M LO GAGE 0 = -0.06 BARS FR.RED.DIA. = 5.8 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 0.6 M HI GAGE 0 = 0.00 BARS LIN.ROD WT. = 8.0 KGF/M DELTA-A = 0.17 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.36 BARS M FACTOR = 1
MAX SU ID = 0.9 SU OPTION = 0 MIN PHI ID = 0.9 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE	
*****	******	*****	*****	*****	******	*****	*****	*****	*****	******	*****	*****	*****	******	************	
13.20	-6.70	8.40	0.62		219	1.65	1.61					11.43	9.4	509	CLAYEY SILT	
13.40	-6.90	8.24	0.65	ML	228	1.63	1.60					11.27	9.1	526	CLAYEY SILT	
13.60	-7.10	8.75	0.59		225	1.69	1.75					12.55	10.0	531	SILTY CLAY	(9.8')
13.80	-7.30	7.98	0.75	0.10	263	1.59	1.58					11.03	8.7	597	CLAYEY SILT	
14.00	-7.50	7.32	0.87	0.11	287	1.51	1.44		M̄=605 tsf			9.79	7.6	627	CLAYEY SILT	
14.20	-7.70	8.12	0.76	SM	281	1.61	1.66					11.67	8.9	644	CLAYEY SILT	
14.40	-7.90	7.45	0.77		263	1.52	1.51					10.34	7.8	579	CLAYEY SILT	
14.60	-8.10	8.64	0.62		252	1.68	1.85			607		13.22	9.8	593	CLAYEY SILT	
14.80	-8.30	9.67	0.55		252	1.80	2.16					15.99	11.7	622	SILTY CLAY	
15.00	-8.50	7.70	0.72		269	1.56	1.65					11.37	8.2	600	CLAYEY SILT	49.2'
15.20	-8.70	8.45	0.62		258	1.65	1.87					13.32	9.5	600	CLAYEY SILT	
15.40	-8.90	8.27	0.60		247	1.63	1.85					13.04	9.2	569	CLAYEY SILT	
15.60	-9.10	8.58	0.54		232	1.67	1.96					13.99	9.7	544	SILTY CLAY	
15.80	-9.30	8.39	0.55		232	1.65	1.93					13.69	9.4	539	SILTY CLAY	
16.00	-9.50	8.55	0.54		236	1.67	2.00		M̄ = 585 tsf			14.25	9.6	551	SILTY CLAY	(6.6')
16.20	-9.70	8.50	0.53		232	1.66	2.01					14.31	9.6	542	SILTY CLAY	
16.40	-9.90	7.72	0.60	SM	245	1.56	1.80					12.44	8.2	547	CLAYEY SILT	
16.60	-10.10	7.93	0.59		250	1.59	1.89					13.15	8.6	566	SILTY CLAY	
16.80	-10.30	7.84	0.64		270	1.58	1.88					13.06	8.4	608	CLAYEY SILT	
17.00	-10.50	7.53	0.59		243	1.53	1.81					12.42	7.9	537	SILTY CLAY	55.8'
17.20	-10.70	7.98	0.66		289	1.59	1.97					13.78	8.7	655	CLAYEY SILT	
17.40	-10.90	8.88	0.45		225	1.71	2.29					16.49	10.2	535	SILTY CLAY	
17.60	-11.10	8.47	0.42		203	1.66	2.18					15.51	9.5	473	SILTY CLAY	
17.80	-11.30	7.99	0.46		210	1.59	2.05					14.33	8.7	477	SILTY CLAY	
18.00	-11.50	8.03	0.46		216	1.60	2.09					14.61	8.7	491	SILTY CLAY	(7.2')
18.20	-11.70	9.05	0.46		243	1.73	2.46		M̄ =500tsf			17.83	10.5	583	SILTY CLAY	
1[illegible]	-11.90	8.26	0.43	CLAY	210	1.63	2.22					15.63	9.1	484	SILTY CLAY	
1[illegible]	-12.10	8.30	0.33		167	1.64	2.26			503		15.95	9.2	385	CLAY	
18.80	-12.30	8.10	0.33		163	1.61	2.21					15.49	8.9	372	CLAY	
19.00	-12.50	7.54	0.39		181	1.54	2.04					14.00	7.9	400	SILTY CLAY	
19.20	-12.70	7.26	0.46		207	1.50	1.97					13.34	7.5	449	SILTY CLAY	63.0'
19.40	-12.90	7.62	0.43		203	1.55	2.11					14.54	8.1	451	SILTY CLAY	
19.60	-13.10	7.48	0.41	SILTY	196	1.53	2.09					14.27	7.8	431	SILTY CLAY	
19.80	-13.30	7.40	0.41	CLAY	192	1.52	2.08		M̄=445tsf			14.17	7.7	421	SILTY CLAY	(4')
20.00	-13.50	7.85	0.39	SM	199	1.58	2.26					15.69	8.4	449	SILTY CLAY	
20.20	-13.70	7.44	0.40		192	1.52	2.14			448		14.59	7.8	422	SILTY CLAY	
20.40	-13.90	6.73	0.43		192	1.43	1.90					12.59	6.6	402	SILTY CLAY	67'
20.60	-14.10	7.13	0.39		185	1.48	2.06					13.92	7.3	398	SILTY CLAY	
20.80	-14.30	6.99	0.43		203	1.46	2.03					13.62	7.1	433	SILTY CLAY	
21.00	-14.50	6.21	0.44		187	1.35	1.77					11.43	5.9	375	SILTY CLAY	
21.20	-14.70	6.98	0.34		163	1.46	2.06					13.82	7.0	347	CLAY	
21.40	-14.90	7.00	0.35		167	1.46	2.09					14.02	7.1	356	CLAY	
21.60	-15.10	6.81	0.42		199	1.44	2.04					13.54	6.8	420	SILTY CLAY	
21.80	-15.30	6.24	0.46		203	1.35	1.84					11.93	5.9	409	SILTY CLAY	
22.00	-15.50	6.79	0.37		176	1.43	2.06					13.71	6.7	369	SILTY CLAY	
22.20	-15.70	6.95	0.38		188	1.46	2.15					14.35	7.0	401	SILTY CLAY	
22.40	-15.90	6.65	0.36		170	1.41	2.05					13.52	6.5	354	SILTY CLAY	
22.60	-16.10	6.55	0.46		218	1.40	2.03					13.32	6.4	449	SILTY CLAY	
22.80	-16.30	6.72	0.28		137	1.42	2.12					14.00	6.6	287	CLAY	(17')
23.00	-16.50	6.15	0.43	CLAY	196	1.34	1.91					12.29	5.8	392	SILTY CLAY	
23.20	-16.70	6.28	0.39		183	1.36	1.98					12.81	6.0	370	SILTY CLAY	
23.40	-16.90	6.43	0.31		152	1.38	2.05					13.38	6.2	311	CLAY	
23.60	-17.10	6.11	0.41		188	1.34	1.94		M̄=395 tsf			12.48	5.7	376	SILTY CLAY	
23.80	-17.30	6.08	0.30		141	1.33	1.95					12.49	5.7	281	CLAY	
24.00	-17.50	6.13	0.41		196	1.34	1.98			396		12.74	5.7	391	SILTY CLAY	
24.20	-17.70	5.99	0.39		179	1.32	1.94					12.39	5.5	354	SILTY CLAY	
24.40	-17.90	6.16	0.38		181	1.34	2.02					13.03	5.8	363	SILTY CLAY	
24.60	-18.10	5.84	0.39		181	1.29	1.91					12.08	5.3	353	SILTY CLAY	
24.80	-18.30	6.10	0.40		194	1.33	2.03					13.05	5.7	386	SILTY CLAY	
25.00	-18.50	5.64	0.40		181	1.26	1.86					11.64	5.0	347	SILTY CLAY	
25.20	-18.70	5.34	0.58		250	1.22	1.75					10.75	4.6	465	SILTY CLAY	
25.40	-18.90	5.82	0.44		208	1.29	1.96					12.41	5.3	405	SILTY CLAY	
25.60	-19.10	5.83	0.50		239	1.29	1.98					12.55	5.3	466	SILTY CLAY	84'
25.80	-19.30	5.87	0.43		210	1.30	2.02					12.80	5.4	411	SILTY CLAY	
26.00	-19.50	5.34	0.54		239	1.22	1.81					11.13	4.6	444	SILTY CLAY	

13d

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO. : P-1
In-Situ Soil Testing, L.C.                                                              Page 3b
JOB FILE: Suffolk Regional Landfill                                                     FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                            SNDG. DATE: 05/02/07
A    .BY : Roger Failmezger                                                             ANAL. DATE: 05/05/07

ANALYSIS PARAMETERS:  LO RANGE    =  9.00 BARS  ROD DIAM.     =    4.4 CM      BL.THICK.  =  15.0 MM    SU  FACTOR = 1
SURF.ELEV.  =    6.5 M LO  GAGE 0 = -0.06 BARS  FR.RED.DIA. =    5.8 CM      BL.WIDTH   =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =    0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT. =    8.0 KGF/M DELTA-A    =  0.17 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =   0.5        DELTA-B =  0.36 BARS      M FACTOR = 1
MAX SU ID   =    0.9   SU OPTION  =     0      MIN PHI ID  =   0.9        OCR OPTION =     0          K0 FACTOR  = 1
UNIT CONVERSIONS:      1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT


  Z     ELEV     KD     ID     UD     ED      K0      SU     QD     PHI    SIGFF    PHIO     PC     OCR      M       SOIL TYPE
 (M)    (M)                          (BAR)           (BAR)  (BAR)  (DEG)  (BAR)    (DEG)   (BAR)          (BAR)
***** ******  ***** ***** ***** ******  *****   *****  *****  *****  ******   *****   *****   *****  ******  ************
26.20 -19.70   6.03   0.74           374    1.32    2.12                               13.59    5.6     743   CLAYEY SILT  (5.2')
26.40 -19.90   6.49   0.57    CLAY)  316    1.39    2.35                               15.38    6.3     650   SILTY CLAY
26.60 -20.10   6.90   0.34           203    1.45    2.55          M̄ = 540 tsf          17.05    6.9     430   CLAY
26.80 -20.30   5.95   0.69           356    1.31    2.14                               13.63    5.5     701   CLAYEY SILT
27.00 -20.50   6.43   0.28           159    1.38    2.38                               15.54    6.2     326   CLAY
27.20 -20.70   5.63   0.45           225    1.26    2.03                               12.72    5.0     430   SILTY CLAY   89.2'
____________________________________________________________________________________________________________________
27.40 -20.90   4.92   0.32           141    1.15    1.73                               10.38    4.1     250   CLAY
27.60 -21.10   5.05   0.40           179    1.17    1.80                               10.90    4.2     323   SILTY CLAY
27.80 -21.30   4.79   0.53           228    1.13    1.69                               10.10    3.9     399   SILTY CLAY
28.00 -21.50   4.80   0.62           269    1.13    1.71                               10.22    3.9     470   CLAYEY SILT
28.20 -21.70   4.98   0.58           265    1.16    1.81                               10.92    4.2     473   SILTY CLAY
28.40 -21.90   4.16   0.42           159    1.02    1.46                                8.31    3.1     255   SILTY CLAY   (11.2')
28.60 -22.10   4.33   0.17            68    1.05    1.54                                8.88    3.3     112   CLAY
28.80 -22.30   4.09   0.42           161    1.00    1.44                                8.20    3.1     255   SILTY CLAY
29.00 -22.50   4.70   0.64           283    1.11    1.73          M̄ = 330 tsf          10.24    3.8     489   CLAYEY SILT
29.20 -22.70   3.76   0.25            90    0.94    1.32              332               7.29    2.7     135   CLAY
29.40 -22.90   4.32   0.53           218    1.04    1.58                                9.12    3.3     357   SILTY CLAY
29.60 -23.10   3.94   0.70           263    0.97    1.42                                7.94    2.9     408   CLAYEY SILT
29.80 -23.30   4.03   0.49           192    0.99    1.47                                8.29    3.0     301   SILTY CLAY
30.00 -23.50   4.39   0.48           205    1.06    1.64                                9.51    3.4     339   SILTY CLAY
30.20 -23.70   4.22   0.35           145    1.03    1.57                                9.02    3.2     234   SILTY CLAY
30.40 -23.90   3.82   0.48           181    0.95    1.40                                7.75    2.7     274   SILTY CLAY
30.60 -24.10   4.13   0.50           203    1.01    1.55                                8.81    3.1     323   SILTY CLAY   100.4'
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Computed: T. Hunkele
Checked: ~~A. Engineer~~
DES
August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section A, Point 1A

$S = \Delta q_s (H) / E$

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

S is the settlement at level n

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results
E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-1 to 100 feet

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
36	36	590	0.3	438	1.3	0.4	0.7	6400	3.20	0.3
39	120	605	0.3	449	1.3	0.4	0.7	6180	3.09	0.8
49	84	585	0.3	435	1.3	0.4	0.7	5870	2.94	0.6
56	84	500	0.3	371	1.3	0.4	0.7	5715	2.86	0.6
63	48	445	0.3	331	1.3	0.4	0.7	5610	2.81	0.4
68	204	395	0.3	293	1.3	0.4	0.7	5360	2.68	1.9
85	60	540	0.3	401	1.3	0.4	0.7	5250	2.63	0.4
90	120	330	0.3	245	1.3	0.4	0.7	5225	2.61	1.3
100	1200	550	0.3	409	1.3	0.4	0.7	4960	2.48	7.3
200	1200	400	0.4	187	1.4	0.2	0.6	4750	2.38	15.3
300	1200	990	0.2	891	1.2	0.6	0.8	4490	2.25	3.0
400	1200	740	0.4	345	1.4	0.2	0.6	4245	2.12	7.4
500	6000	1710	0.2	1539	1.2	0.6	0.8	3500	1.75	6.8
1000									**Total**	46

▨ Settlement to 63 feet below the liner based on Boring P-1 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-1 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & **P**-1 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & **P**-1 DMT

▨ Settlement extrapolated from Well data & P-1 DMT to 1000 feet in Patuxent Formation

Yorktown Formation	1.1 feet	Mattaponi Formation & Trans. Bed	0.9 feet
Calvert Formation	1.3 feet	Patuxent Formation	0.6 feet
		Total Settlement	4 feet

*depth at mid-point of soil layer.
e.g. Z=1.5 feet at depth = 37.5 feet

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: ~~A. Engineer~~
DES.

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section A, Point 2

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu)(1-2\mu) / (1-\mu)$

E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-1 to 100 feet

Top/Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
36	36	590	0.3	438	1.3	0.4	0.7	6570	3.29	0.3
39	120	605	0.3	449	1.3	0.4	0.7	6560	3.28	0.9
49	84	585	0.3	435	1.3	0.4	0.7	6550	3.28	0.6
56	84	500	0.3	371	1.3	0.4	0.7	6540	3.27	0.7
63	48	445	0.3	331	1.3	0.4	0.7	6530	3.27	0.5
68	204	395	0.3	293	1.3	0.4	0.7	6515	3.26	2.3
85	60	540	0.3	401	1.3	0.4	0.7	6505	3.25	0.5
90	120	330	0.3	245	1.3	0.4	0.7	6495	3.25	1.6
100	1200	550	0.3	409	1.3	0.4	0.7	6420	3.21	9.4
200	1200	400	0.4	187	1.4	0.2	0.6	6285	3.14	20.2
300	1200	990	0.2	891	1.2	0.6	0.8	6006	3.00	4.0
400	1200	740	0.4	345	1.4	0.2	0.6	5570	2.79	9.7
500	6000	1710	0.2	1539	1.2	0.6	0.8	4295	2.15	8.4
1000									**Total**	59

▨ Settlement to 63 feet below the liner based on Boring P-1 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-1 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-1 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-1 DMT

▨ Settlement extrapolated from Well data & P-1 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 1.4 feet
Mattaponi Formation & Trans. Beds 1.1 feet
Calvert Formation 1.7 feet
Patuxent Formation 0.7 feet
Total Settlement 5 feet

*depth at mid-point of soil layer.
e.g. Z=1.5 feet at depth =37.5 feet

15a

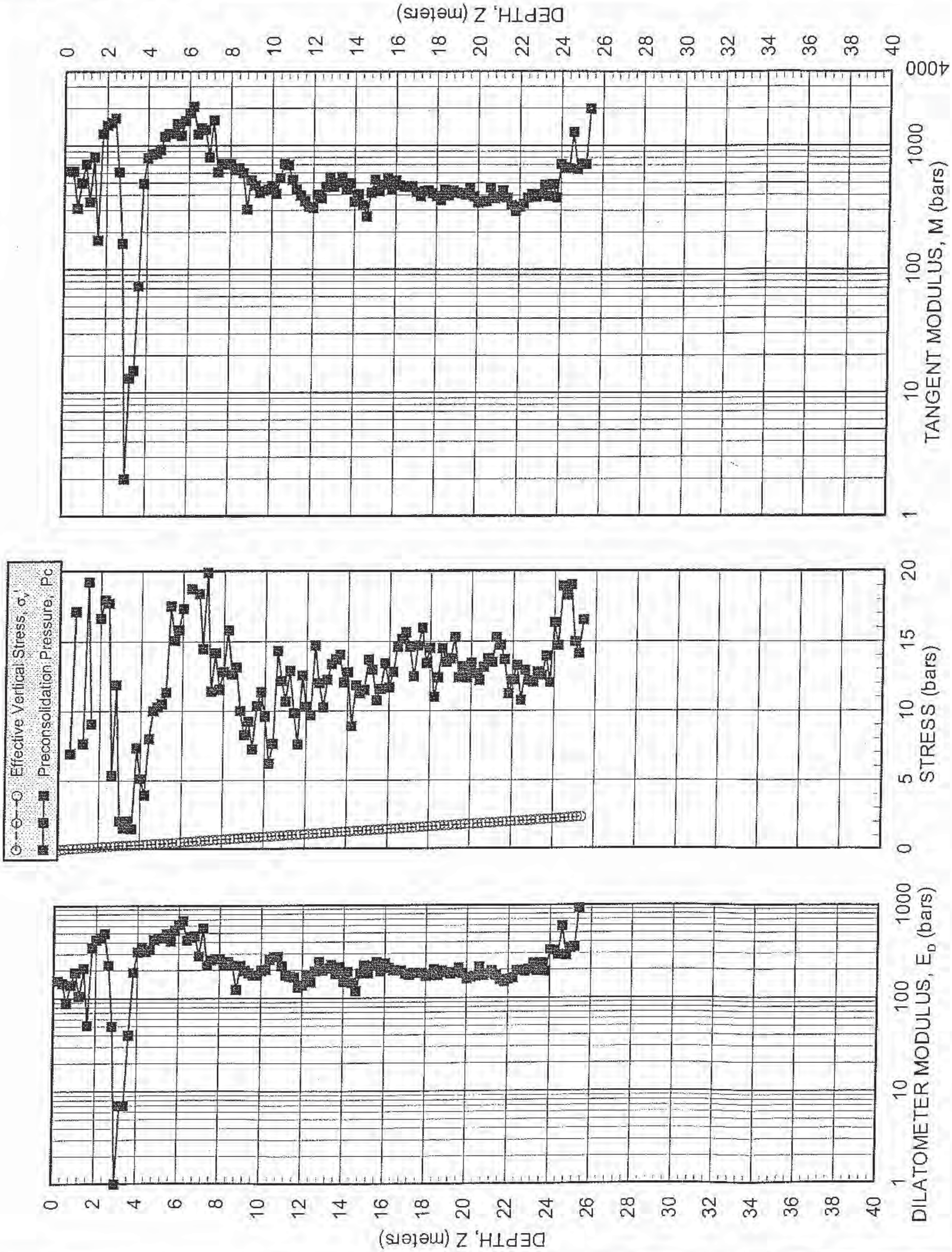
PROJECT: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 5/2/07

SOUNDING
P-12

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~5.9 m
Water Depth: ~0.6 m



Computed: T. Hunkele
Checked: ~~A. Engineer~~
DEL
August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section B, Point 3

$S = \Delta q_s (H) / E$

$E = M (1+\mu)(1-2\mu) / (1-\mu)$

S is the settlement at level n

H is the soil layer thickness

M is the Tangent Modulus derived from DMT Results

E is the drained Young's Modulus of Elasticity

μ is the drained Poisson Ratio for the soil type in layer n

Δq_s is the average bearing pressure increase at level n

Boring P-12 to 100 feet

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
0	144	630	0.3	468	1.3	0.4	0.7	570	0.29	0.1
12	96	1270	0.3	943	1.3	0.4	0.7	670	0.34	0.0
20	132	830	0.3	617	1.3	0.4	0.7	790	0.40	0.1
31	96	485	0.3	360	1.3	0.4	0.7	835	0.42	0.1
39	348	447	0.3	332	1.3	0.4	0.7	1080	0.54	0.6
68	180	373	0.3	277	1.3	0.4	0.7	1300	0.65	0.4
83	120	430	0.3	319	1.3	0.4	0.7	1352	0.68	0.3
93	84	715	0.3	531	1.3	0.4	0.7	1366	0.68	0.1
100	1200	700	0.3	520	1.3	0.4	0.7	1445	0.72	1.7
200	1200	490	0.4	229	1.4	0.2	0.6	1340	0.67	3.5
300	1200	550	0.2	495	1.2	0.6	0.8	1195	0.60	1.4
400	1200	540	0.4	252	1.4	0.2	0.6	1045	0.52	2.5
500	6000	1440	0.2	1296	1.2	0.6	0.8	680	0.34	1.6
1000									**Total**	12

▨ Settlement to 100 feet below the ground surface based on Boring P-12 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-12 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-12 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-12 DMT

▨ Settlement extrapolated from Well data & P-12 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 0.3 feet

Mattaponi Formation & Trans. Beds 0.3 feet

Calvert Formation 0.3 feet

Patuxent Formation 0.1 feet

Total Settlement 1 feet

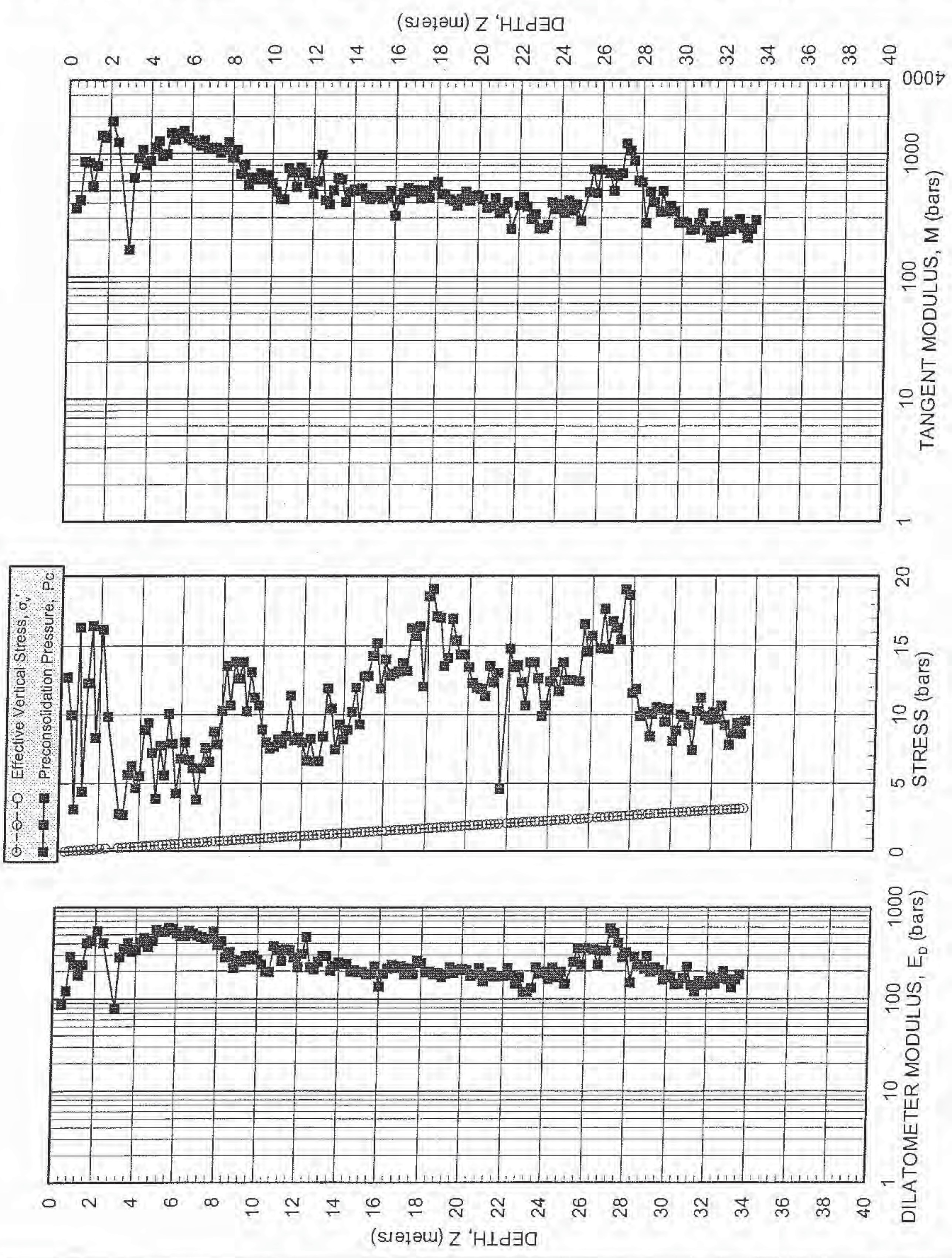
*depth at mid-point of soil layer.
e.g. Z=6 feet at depth =6 feet

PROJECT: Suffolk Regional Landfill **LOCATION:** Suffolk, Virginia	IN-SITU SOIL TESTING, L.C. ENGINEER: R. Failmezger SOUNDING DATE: 4/21/07	SOUNDING

INTERPRETED DMT DEFORMATION PARAMETERS

P-8

Ground Surface Elev.: ~5.8 m
Water Depth: ~0.6 m



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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)      SNDG. NO. : P-8
In-Situ Soil Testing, L.C.                                                           Page 1b
JOB FILE: Suffolk Regional Landfill                                                  FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                         SNDG. DATE: 04/21/07
ANAL.BY : Roger Failmezger                                                           ANAL. DATE: 04/27/07

ANALYSIS PARAMETERS:  LO RANGE   =  8.50 BARS  ROD DIAM.    =   4.4 CM    BL.THICK.  =  15.0 MM    SU  FACTOR = 1
SURF.ELEV.  =   5.8 M LO  GAGE 0 = -0.04 BARS  FR.RED.DIA.  =   5.8 CM    BL.WIDTH   =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =   0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT.  =   8.0 KGF/M DELTA-A    =   0.17 BARS  OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =   0.5       DELTA-B =  0.32 BARS     M FACTOR = 1
MAX SU ID   =   0.9   SU OPTION   =     0       MIN PHI ID  =   0.9       OCR OPTION =    0         KO FACTOR  = 1
UNIT CONVERSIONS:     1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

   Z     ELEV     KD     ID    UD     ED       KO     SU     QD     PHI    SIGFF   PHIO     PC     OCR      M      SOIL TYPE
  (M)     (M)                        (BAR)          (BAR)  (BAR)  (DEG)  (BAR)   (DEG)   (BAR)           (BAR)
***** ****** ***** ***** ***** ******   *****  *****  *****  *****  ******  *****   *****  *****  ******  ************
 0.40    5.40  56.14  0.64             87   4.89   1.00                                  12.72  181.7    361  CLAYEY SILT
 0.60    5.20  26.70  1.25            122   3.44          11.2   36.4   0.17    31.4    9.98   94.7    420  SANDY SILT
 0.80    5.00  16.84  4.04            288   1.89          47.4   45.5   0.21    42.0    3.14   25.8    863  SAND
 1.00    4.80  31.93  1.53            235   3.97          31.3   39.8   0.23    35.7   16.35  117.9    845  SANDY SILT
 1.20    4.60  16.49  2.04            181   2.00          40.1   42.8   0.26    39.3    4.43   28.5    538  SILTY SAND
 1.40    4.40  25.98  1.51            234   3.17          53.2   42.1   0.29    38.7   12.31   71.5    795  SANDY SILT
 1.60    4.20  29.41  2.08            403   3.53          82.3   43.3   0.32    40.2   16.47   86.8   1418  SILTY SAND
 1.80    4.00  20.87  2.80            425   2.38         108.3   45.5   0.36    42.8    8.33   39.8   1358  SILTY SAND
 2.10    3.70  24.83  2.66            548   3.07          61.9   41.2   0.40    38.2   16.20   67.8   1843  SILTY SAND
 2.40    3.40  18.08  2.40            404   2.27          54.3   40.9   0.44    38.1    9.86   36.8   1238  SILTY SAND
 3.00    2.80   6.75  1.05             78   1.20           7.9   29.8   0.48    26.2    2.81    8.8    165  SILT
 3.20    2.60   7.45  3.27            282   1.11          23.2   36.8   0.53    33.9    2.71    8.1    634  SILTY SAND
 3.40    2.40  11.01  2.63            353   1.52          31.3   37.5   0.57    34.8    5.65   16.1    916  SILTY SAND
 3.60    2.20  11.55  2.75            408   1.56          39.4   38.4   0.60    35.9    6.29   17.0   1076  SILTY SAND
 3.80    2.00   9.79  2.47            326   1.31          46.9   39.6   0.64    37.3    4.65   12.0    810  SILTY SAND
 4.00    1.80  10.21  2.39            345   1.40          40.4   38.3   0.66    35.9    5.52   13.6    869  SILTY SAND
 4.20    1.60  12.97  2.14            410   1.72          51.1   38.8   0.69    36.6    8.88   20.9   1126  SILTY SAND
 4.40    1.40  13.13  2.25            457   1.73          56.9   39.2   0.73    37.0    9.40   21.1   1260  SILTY SAND
 4.60    1.20  11.14  2.04            367   1.49          53.9   39.0   0.76    36.9    7.23   15.6    954  SILTY SAND
 4.80    1.00   7.99  3.19            428   1.08          59.1   40.2   0.80    38.2    3.89    8.0    988  SILTY SAND
 5.00    0.80  11.39  2.82            561   1.48          75.0   40.4   0.83    38.6    7.75   15.4   1471  SILTY SAND
 5.20    0.60   9.46  3.09            530   1.24          75.9   40.8   0.87    39.0    5.59   10.7   1300  SILTY SAND
 5.40    0.40  12.46  2.28            536   1.62          78.6   40.0   0.89    38.2   10.06   18.5   1451  SILTY SAND
 5.60    0.20  10.89  2.78            592   1.41          84.2   40.6   0.93    38.9    7.90   14.0   1528  SILTY SAND
 5.80    0.00   8.06  3.55            579   1.01         101.1   42.2   0.97    40.7    4.25    7.3   1338  SAND
 6.00   -0.20   9.89  2.48            513   1.26         100.0   41.4   1.00    39.9    6.78   11.3   1279  SILTY SAND
 6 20   -0.40  10.31  2.17            483   1.36          85.8   40.2   1.02    38.7    7.98   12.8   1222  SILTY SAND
        -0.60   9.05  2.38            479   1.23          72.4   39.4   1.05    37.8    6.70   10.5   1154  SILTY SAND
        -0.80   8.37  2.85            547   1.17          66.7   38.9   1.08    37.3    6.11    9.2   1282  SILTY SAND
 6.80   -1.00   6.43  3.41            517   0.92          68.6   39.4   1.11    38.0    3.83    5.6   1094  SAND
 7.00   -1.20   7.90  2.55            490   1.14          58.8   37.8   1.13    36.4    6.07    8.7   1121  SILTY SAND
 7.20   -1.40   8.75  2.15            470   1.25          60.4   37.6   1.16    36.2    7.56   10.5   1116  SILTY SAND
 7.40   -1.60   7.94  2.19            446   1.16          58.2   37.4   1.19    36.0    6.57    8.9   1019  SILTY SAND
 7.60   -1.80   8.81  1.95            451   1.32          43.4   35.1   1.20    33.7    8.76   11.5   1075  SILTY SAND
 7.80   -2.00   8.22  2.42            537   1.23          46.9   35.6   1.23    34.2    7.82   10.0   1247  SILTY SAND
 8.00   -2.20   9.32  1.48            381   1.38          44.2   34.8   1.25    33.4   10.29   12.9    926  SANDY SILT
 8.20   -2.40  10.40  1.44            423   1.55          37.1   33.3   1.26    31.8   13.56   16.6   1073  SANDY SILT
 8.40   -2.60   9.13  1.07            282   1.38          40.8   34.0   1.30    32.7   10.66   12.8    681  SILT
 8.60   -2.80  10.07  1.08            323   1.53          32.6   32.2   1.31    30.7   13.81   16.2    809  SILT
 8.80   -3.00  11.09  0.64            215   1.96   1.63                                  12.61   14.5    559  CLAYEY SILT
 9.00   -3.20   9.19  0.92            263   1.49          23.1   29.6   1.33    28.1   13.82   15.5    634  SILT
 9.20   -3.40   9.43  0.85            252   1.77   1.39                                  10.23   11.2    615  CLAYEY SILT
 9.40   -3.60   8.73  1.04            292   1.44          23.9   29.6   1.39    28.2   13.07   14.1    690  SILT
 9.60   -3.80   8.10  1.01            268   1.35          26.2   30.3   1.42    29.0   11.25   11.9    614  SILT
 9.80   -4.00   7.75  1.14            295   1.31          26.0   30.1   1.45    28.9   10.67   11.0    663  SILT
10.00   -4.20   6.95  1.13            268   1.21          26.6   30.3   1.48    29.1    8.92    9.1    573  SILT
10.20   -4.40   6.48  1.05            237   1.14          27.8   30.6   1.51    29.5    7.97    8.0    491  SILT
10.40   -4.60   7.18  0.77            197   1.49   1.11                                   7.51    7.4    427  CLAYEY SILT
10.60   -4.80   7.20  0.75            195   1.49   1.14                                   7.68    7.4    422  CLAYEY SILT
10.80   -5.00   6.21  1.63            371   1.14          25.6   29.7   1.58    28.6    8.19    7.7    759  SANDY SILT
11.00   -5.20   6.47  1.39            336   1.09          38.6   32.5   1.66    31.6    7.90    7.3    698  SANDY SILT
11.20   -5.40   6.61  1.02            257   1.12          36.9   32.0   1.68    31.1    8.46    7.7    535  SILT
11.40   -5.60   7.75  1.14            343   1.26          37.9   31.8   1.70    30.9   11.39   10.2    771  SILT
11.60   -5.80   6.39  1.35            338   1.08          41.6   32.7   1.75    31.8    8.11    7.2    698  SANDY SILT
11.80   -6.00   6.35  1.10            280   1.09          38.1   31.9   1.76    31.1    8.34    7.2    574  SILT
12.00   -6.20   6.83  0.80            221   1.44   1.20                                   7.96    6.8    467  CLAYEY SILT
12.20   -6.40   5.60  1.33            308   0.96          48.8   33.7   1.85    32.9    6.65    5.6    596  SANDY SILT
12.40   -6.60   6.47  1.73            469   1.04          60.2   34.8   1.90    34.1    8.26    6.8    977  SANDY SILT
12.60   -6.80   5.43  0.95            220   0.95          47.6   33.3   1.90    32.6    6.61    5.4    416  SILT
12.80   -7.00   5.22  0.93            209   0.95          39.4   31.9   1.90    31.2    6.61    5.3    387  SILT
13.00   -7.20   5.98  0.97            254   1.06          39.1   31.5   1.93    30.9    8.43    6.7    503  SILT
13.20   -7.40   7.20  0.91            292   1.21          38.9   31.1   1.95    30.5   11.91    9.3    633  SILT
13.40   -7.60   6.77  0.95            292   1.14          44.5   32.1   1.99    31.5   10.44    8.0    616  SILT
13.60   -7.80   6.07  0.73            203   1.33   1.16                                   7.47    5.7    404  CLAYEY SILT
13.80   -8.00   6.92  0.71            228   1.45   1.39                                   9.28    6.9    485  CLAYEY SILT
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Boundary

EXC FOR LF

Clay w/ Shells

M̄ = 630 tsf

H
(6.6'
= 78.72")

Silty Sand

(14.4'
= 172.8")

16 b

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)
In-Situ Soil Testing, L.C.
JOB FILE: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew
ANAL.BY : Roger Failmezger

SNDG. NO. : P-8
Page 2b
FILE NO. :2007-25

SNDG. DATE: 04/21/07
ANAL. DATE: 04/27/07

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A    SIS PARAMETERS:  LO RANGE   =  8.50 BARS  ROD DIAM.     =   4.4 CM     BL.THICK.   =  15.0 MM     SU  FACTOR = 1
SURF.ELEV.  =   5.8 M LO  GAGE 0 = -0.04 BARS  FR.RED.DIA.  =   5.8 CM     BL.WIDTH    =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =   0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT.  =   8.0 KGF/M DELTA-A     =  0.17 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =   0.5       DELTA-B =  0.32 BARS      M FACTOR = 1
MAX SU ID   =   0.9   SU OPTION   =     0       MIN PHI ID  =   0.9       OCR OPTION =     0         K0 FACTOR  = 1
UNIT CONVERSIONS:     1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT
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(H)

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	K0	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
*****	******	*****	*****	*****	******	*****	*****	*****	*****	******	*****	*****	*****	******	************
14.00	-8.20	6.35	0.84		250	1.37	1.26					8.22	6.1	510	CLAYEY SILT
14.20	-8.40	6.62	0.76		241	1.41	1.35					8.90	6.5	501	CLAYEY SILT
14.40	-8.60	7.16	0.70		241	1.48	1.51					10.20	7.3	520	CLAYEY SILT
14.60	-8.80	7.87	0.52		199	1.58	1.72					11.98	8.5	449	SILTY CLAY
14.80	-9.00	6.64	0.62		204	1.41	1.41					9.30	6.5	425	CLAYEY SILT
15.00	-9.20	8.07	0.48		195	1.61	1.82					12.76	8.8	445	SILTY CLAY
15.20	-9.40	8.02	0.48		197	1.60	1.83					12.81	8.7	448	SILTY CLAY
15.40	-9.60	8.54	0.42		183	1.66	2.00					14.27	9.6	427	SILTY CLAY
15.60	-9.80	8.82	0.41		188	1.70	2.11					15.19	10.1	446	SILTY CLAY
15.80	-10.00	7.48	0.57		226	1.53	1.74					11.90	7.8	498	SILTY CLAY
16.00	-10.20	8.24	0.31		135	1.63	1.99					14.01	9.1	311	CLAY
16.20	-10.40	7.74	0.45		188	1.56	1.86					12.83	8.3	421	SILTY CLAY
16.40	-10.60	7.74	0.51		214	1.56	1.88					12.99	8.3	478	SILTY CLAY
16.60	-10.80	7.75	0.55		234	1.56	1.90					13.17	8.3	523	SILTY CLAY
16.80	-11.00	7.92	0.49		217	1.59	1.98					13.76	8.6	491	SILTY CLAY
17.00	-11.20	7.66	0.53		228	1.55	1.92					13.20	8.1	508	SILTY CLAY
17.20	-11.40	8.70	0.37		183	1.68	2.27					16.27	9.9	430	SILTY CLAY
17.40	-11.60	8.44	0.44		215	1.65	2.21					15.70	9.4	501	SILTY CLAY
17.60	-11.80	8.62	0.37		184	1.67	2.30					16.42	9.8	433	SILTY CLAY
17.80	-12.00	7.01	0.63		259	1.46	1.79					12.03	7.1	553	CLAYEY SILT
18.00	-12.20	9.19	0.45		244	1.74	2.55					18.59	10.8	590	SILTY CLAY
18.20	-12.40	9.28	0.34		193	1.76	2.61					19.11	11.0	469	CLAY
18.40	-12.60	8.59	0.38		199	1.67	2.40					17.14	9.7	466	SILTY CLAY
18.60	-12.80	8.49	0.35		183	1.66	2.39					17.03	9.5	426	CLAY
18.80	-13.00	7.28	0.42		190	1.50	1.99					13.53	7.5	413	SILTY CLAY
19.00	-13.20	7.43	0.37		172	1.52	2.07					14.11	7.7	377	SILTY CLAY
19.20	-13.40	8.31	0.35		186	1.64	2.40					16.97	9.2	430	SILTY CLAY
1	-13.60	7.75	0.44		219	1.56	2.23					15.40	8.3	490	SILTY CLAY
1	-13.80	7.37	0.40		190	1.51	2.11					14.37	7.6	415	SILTY CLAY
19.80	-14.00	7.32	0.43		206	1.51	2.12					14.38	7.6	450	SILTY CLAY
20.00	-14.20	6.97	0.46		212	1.46	2.01					13.46	7.0	451	SILTY CLAY
20.20	-14.40	6.54	0.47		204	1.40	1.87					12.30	6.4	422	SILTY CLAY
20.40	-14.60	6.39	0.41		177	1.38	1.84					11.96	6.1	361	SILTY CLAY
20.60	-14.80	6.32	0.42		183	1.37	1.83					11.86	6.0	371	SILTY CLAY
20.80	-15.00	6.10	0.52		217	1.33	1.77					11.34	5.7	433	SILTY CLAY
21.00	-15.20	6.81	0.33		155	1.44	2.04					13.56	6.8	327	CLAY
21.20	-15.40	6.38	0.39		175	1.37	1.90					12.36	6.1	357	SILTY CLAY
21.40	-15.60	6.57	0.42		193	1.40	1.99					13.05	6.4	400	SILTY CLAY
21.60	-15.80	3.33	0.74		175	0.86	0.86					4.57	2.2	243	CLAYEY SILT
22.00	-16.20	6.99	0.35		177	1.46	2.21					14.79	7.0	378	CLAY
22.20	-16.40	6.54	0.45		215	1.40	2.05					13.45	6.3	444	SILTY CLAY
22.40	-16.60	6.54	0.37		179	1.40	2.07					13.58	6.3	369	SILTY CLAY
22.60	-16.80	6.13	0.32		146	1.34	1.92					12.36	5.7	292	CLAY
22.80	-17.00	5.55	0.41		170	1.25	1.71					10.67	4.9	322	SILTY CLAY
23.00	-17.20	6.51	0.24		119	1.39	2.11					13.80	6.3	245	CLAY
23.20	-17.40	6.47	0.24		119	1.39	2.11					13.79	6.2	244	CLAY
23.40	-17.60	6.09	0.28		132	1.33	1.97					12.64	5.7	262	CLAY
23.60	-17.80	5.17	0.54		219	1.19	1.62					9.89	4.4	400	SILTY CLAY
23.80	-18.00	5.41	0.44		188	1.23	1.73					10.68	4.7	352	SILTY CLAY
24.00	-18.20	5.92	0.42		197	1.31	1.95					12.40	5.4	387	SILTY CLAY
24.20	-18.40	6.11	0.34		164	1.33	2.04					13.10	5.7	328	CLAY
24.40	-18.60	5.65	0.48		217	1.27	1.87					11.71	5.1	416	SILTY CLAY
24.60	-18.80	6.25	0.34		172	1.36	2.13					13.80	5.9	346	CLAY
24.80	-19.00	5.84	0.41		197	1.29	1.97					12.50	5.3	384	SILTY CLAY
25.00	-19.20	5.82	0.31		146	1.29	1.98					12.52	5.3	284	CLAY
25.40	-19.60	5.73	0.53		252	1.28	1.97					12.43	5.2	486	SILTY CLAY
25.60	-19.80	6.85	0.61		354	1.44	2.49					16.57	6.8	747	CLAYEY SILT
25.80	-20.00	6.28	0.44		237	1.36	2.25					14.58	6.0	480	SILTY CLAY
26.00	-20.20	6.55	0.64		357	1.40	2.40					15.73	6.4	739	CLAYEY SILT
26.40	-20.60	6.23	0.63		343	1.35	2.29					14.81	5.9	691	CLAYEY SILT
26.60	-20.80	6.94	0.38		234	1.45	2.64					17.67	7.0	497	SILTY CLAY
26.80	-21.00	6.16	0.61		332	1.34	2.29					14.78	5.8	665	CLAYEY SILT
27.00	-21.20	6.65	0.56		332	1.41	2.54					16.77	6.5	691	SILTY CLAY
27.20	-21.40	6.41	1.01		583	0.99		175.5	36.8	4.15	37.5	16.29	6.3	1200	SILT
27.40	-21.60	6.27	0.91		521	0.95		193.5	37.4	4.21	38.1	15.44	5.9	1059	SILT

Silt Sand w/ clay

M = 520 tsf
524

514 tsf ✓

(6.6' = 78.74")

Clay & Silt

M = 456 tsf ✓

(7.2' = 86.61")

Clay

M = 360 tsf
361

(15.7' = 189")

Silt & Clay

M = 743 tsf ✓

(9.8' = 118.1")

16c

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)     SNDG. NO. : P-8
In-Situ Soil Testing, L.C.                                                           Page 3b
JOB FILE: Suffolk Regional Landfill                                                  FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                         SNDG. DATE: 04/21/07
ANAL.BY : Roger Failmezger                                                           ANAL. DATE: 04/27/07

A   SIS PARAMETERS:  LO RANGE   =  8.50 BARS  ROD DIAM.    =   4.4 CM    BL.THICK.  =  15.0 MM    SU  FACTOR = 1
SURF.ELEV.  =   5.8 M LO  GAGE 0 = -0.04 BARS  FR.RED.DIA. =   5.8 CM    BL.WIDTH   =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =   0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT. =   8.0 KGF/M DELTA-A    =  0.17 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =   0.5      DELTA-B =  0.32 BARS     M FACTOR = 1
MAX SU ID   =   0.9   SU OPTION   =    0       MIN PHI ID  =   0.9      OCR OPTION =    0         K0 FACTOR  = 1
UNIT CONVERSIONS:      1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI    1 M = 3.2808 FT

  Z     ELEV     KD    ID    UD    ED      K0     SU     QD     PHI   SIGFF   PHIO    PC     OCR     M     SOIL TYPE
 (M)    (M)                      (BAR)          (BAR)  (BAR)  (DEG)  (BAR)  (DEG)  (BAR)          (BAR)
***** ******  ***** ***** ***** ******  *****  *****  *****  *****  ****** *****  *****  *****  ******  ************
27.60 -21.80  7.11  0.62          407   1.48   2.83                               19.08    7.2    874  CLAYEY SILT
27.80 -22.00  6.97  0.44          283   1.46   2.79                               18.68    7.0    602  SILTY CLAY
28.00 -22.20  5.10  0.68          321   1.18   1.90                               11.57    4.3    582  CLAYEY SILT
28.20 -22.40  5.16  0.31          150   1.19   1.95                               11.87    4.4    273  CLAY
28.40 -22.60  4.57  0.67          288   1.09   1.68                                9.89    3.6    490  CLAYEY SILT
28.60 -22.80  4.65  0.53          235   1.10   1.73                               10.22    3.7    404  SILTY CLAY
28.90 -23.10  4.08  0.54          212   1.00   1.49                                8.43    3.0    335  SILTY CLAY
29.00 -23.20  4.57  0.66          292   1.09   1.71                               10.07    3.6    496  CLAYEY SILT
29.20 -23.40  4.68  0.43          197   1.11   1.78                               10.54    3.8    339  SILTY CLAY
29.40 -23.60  4.63  0.48          219   1.10   1.77                               10.44    3.7    375  SILTY CLAY
29.60 -23.80  4.34  0.48          206   1.05   1.64                                9.48    3.3    339  SILTY CLAY
29.80 -24.00  4.59  0.35          161   1.09   1.77                               10.42    3.7    273  SILTY CLAY
30.00 -24.20  3.88  0.47          183   0.96   1.45                                8.07    2.8    279  SILTY CLAY
30.20 -24.40  4.10  0.42          172   1.00   1.56                                8.84    3.1    272  SILTY CLAY
30.40 -24.60  4.42  0.32          144   1.06   1.72                               10.02    3.5    240  CLAY
30.60 -24.80  4.36  0.33          146   1.05   1.70                                9.84    3.4    241  CLAY
30.80 -25.00  4.18  0.39          168   1.02   1.62                                9.27    3.2    270  SILTY CLAY
31.00 -25.20  3.61  0.61          224   0.91   1.36                                7.43    2.5    327  CLAYEY SILT
31.20 -25.40  4.43  0.31          142   1.06   1.77                               10.28    3.5    237  CLAY
31.40 -25.60  4.67  0.25          121   1.11   1.90                               11.24    3.8    207  CLAY
31.60 -25.80  4.29  0.35          157   1.04   1.72                                9.90    3.3    256  SILTY CLAY
31.80 -26.00  4.20  0.32          142   1.02   1.68                                9.63    3.2    229  CLAY
32.00 -26.20  4.33  0.31          142   1.05   1.76                               10.17    3.3    234  CLAY
32.20 -26.40  4.19  0.39          173   1.02   1.70                                9.70    3.2    279  SILTY CLAY
32.40 -26.60  4.43  0.31          146   1.06   1.83                               10.65    3.5    243  CLAY
32.60 -26.80  4.03  0.39          168   0.99   1.64                                9.26    3.0    264  SILTY CLAY
32.80 -27.00  3.60  0.51          201   0.91   1.43                                7.81    2.5    292  SILTY CLAY
3     -27.20  3.83  0.39          163   0.95   1.56                                8.65    2.8    247  SILTY CLAY
3     -27.40  4.03  0.30          132   0.99   1.66                                9.39    3.0    206  CLAY
33.40 -27.60  3.80  0.38          161   0.95   1.55                                8.61    2.7    242  SILTY CLAY
33.60 -27.80  4.04  0.41          183   0.99   1.69                                9.55    3.0    287  SILTY CLAY
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(H)

Silty Clay

$\bar{M} = 398$ tsf

(5.2' - 63'')

Clay

$\bar{M} = 268$ tsf

(13.1' (= 157.5'')

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section B, Point 4

S is the settlement at level n

$S = \Delta q_s (H) / E$

H is the soil layer thickness

M is the Tangent Modulus derived from DMT Results

$E = M (1+\mu)(1-2\mu)/(1-\mu)$

E is the drained Young's Modulus of Elasticity

μ is the drained Poisson Ratio for the soil type in layer n

Boring P-8 to 100 feet

Δq_s is the average bearing pressure increase at level n

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
32	72	630	0.3	468	1.3	0.4	0.7	6290	3.15	0.5
38	180	520	0.3	386	1.3	0.4	0.7	6280	3.14	1.5
53	84	514	0.3	382	1.3	0.4	0.7	6265	3.13	0.7
60	84	456	0.3	339	1.3	0.4	0.7	6255	3.13	0.8
67	180	360	0.3	267	1.3	0.4	0.7	6236	3.12	2.1
82	120	748	0.3	556	1.3	0.4	0.7	6218	3.11	0.7
92	60	398	0.3	296	1.3	0.4	0.7	6204	3.10	0.6
97	156	268	0.3	199	1.3	0.4	0.7	6188	3.09	2.4
110	1080	520	0.3	386	1.3	0.4	0.7	6056	3.03	8.5
200	1200	485	0.4	226	1.4	0.2	0.6	5788	2.89	15.3
300	1200	975	0.2	878	1.2	0.6	0.8	5287	2.64	3.6
400	1200	630	0.4	294	1.4	0.2	0.6	4763	2.38	9.7
500	6000	1240	0.2	1116	1.2	0.6	0.8	3446	1.72	9.3
1000									**Total**	56

▨ Settlement to 68 feet below the liner based on Boring P-8 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-8 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-8 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-8 DMT

▨ Settlement extrapolated from Well data & P-8 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 1.5 feet

Mattaponi Formation & Trans. Beds 1.1 feet

Calvert Formation 1.3 feet

Patuxent Formation 0.8 feet

Total Settlement 5 feet

* depth at mid-point of soil layer.
e.g. Z=3.0 feet at depth = 35 feet

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)
In-Situ Soil Testing, L.C.
JOB FILE: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew
A BY : Roger Failmezger

SNDG. NO. : P-10
Page 1b
FILE NO. :2007-25

SNDG. DATE: 04/21/07
ANAL. DATE: 04/27/07

ANALYSIS PARAMETERS: LO RANGE = 8.50 BARS ROD DIAM. = 4.4 CM BL.THICK. = 15.0 MM SU FACTOR = 1
SURF.ELEV. = 5.8 M LO GAGE 0 = -0.04 BARS FR.RED.DIA. = 5.8 CM BL.WIDTH = 96.0 MM PHI FACTOR = 1
WATER DEPTH = 0.6 M HI GAGE 0 = 0.00 BARS LIN.ROD WT. = 8.0 KGF/M DELTA-A = 0.12 BARS OCR FACTOR = 1
SP.GR.WATER = 1.000 CAL GAGE 0 = 0.00 BARS DELTA / PHI = 0.5 DELTA-B = 0.35 BARS M FACTOR = 1
MAX SU ID = 0.9 SU OPTION = 0 MIN PHI ID = 0.9 OCR OPTION = 0 KO FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	KO	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
*****	******	*****	*****	*****	******	*****	*****	*****	*****	******	*****	*****	*****	******	************
0.20	5.60	30.94	0.33		12	3.55	0.24					2.51	71.7	44	CLAY
0.50	5.30	11.54	2.30		77	1.51		10.2	40.0	0.14	35.1	1.34	16.0	203	SILTY SAND
0.60	5.20	9.27	5.76		187	0.78		34.0	47.7	0.18	44.3	0.51	5.1	454	SAND
0.80	5.00	18.87	1.66		125	2.23		37.4	44.0	0.20	40.2	4.06	35.2	389	SANDY SILT
1.00	4.80	16.73	0.35		26	2.51	0.40					3.52	27.5	77	CLAY
1.20	4.60	15.25	0.26		19	2.37	0.39					3.33	23.8	55	CLAY
1.40	4.40	20.44	1.07		116	2.60		25.9	39.6	0.25	35.7	7.54	49.0	369	SILT
1.60	4.20	24.54	1.13		163	3.03		44.6	41.4	0.28	37.9	11.14	65.7	546	SILT
1.80	4.00	14.54	2.30		216	1.86		30.8	40.5	0.31	37.0	4.55	24.5	617	SILTY SAND
2.00	3.80	17.29	1.71		208	2.24		27.9	38.9	0.33	35.4	7.36	36.3	629	SANDY SILT
2.20	3.60	12.60	2.04		195	1.58		41.6	41.7	0.37	38.6	3.89	17.7	531	SILTY SAND
2.40	3.40	10.16	0.47		39	1.86	0.39					2.97	12.6	98	SILTY CLAY
2.60	3.20	7.35	0.59		38	1.51	0.28					1.89	7.6	82	SILTY CLAY
2.80	3.00	15.39	1.70		238	2.04		28.6	37.8	0.42	34.6	7.86	30.0	692	SANDY SILT
3.00	2.80	17.54	1.52		258	2.25		44.3	39.6	0.46	36.7	10.14	36.4	781	SANDY SILT
3.20	2.60	14.73	1.82		277	1.91		41.9	39.4	0.49	36.6	7.75	26.1	793	SILTY SAND
3.40	2.40	31.28	1.78		613	3.90		73.8	39.7	0.52	37.0	36.00	113.7	2195	SANDY SILT
3.60	2.20	24.52	2.20		633	3.06		76.3	40.4	0.56	37.9	23.12	68.3	2121	SILTY SAND
3.80	2.00	19.32	1.58		381	2.45		64.7	39.9	0.59	37.5	15.58	43.4	1192	SANDY SILT
4.00	1.80	18.69	1.76		432	2.36		72.5	40.4	0.62	38.1	15.11	40.0	1336	SANDY SILT
4.20	1.60	15.17	2.58		540	1.91		76.0	41.0	0.66	38.8	10.33	26.0	1564	SILTY SAND
4.40	1.40	18.15	1.89		497	2.31		74.1	40.1	0.68	37.9	15.94	38.2	1522	SILTY SAND
4.60	1.20	12.97	2.00		392	1.69		62.2	39.8	0.72	37.7	8.80	20.2	1077	SILTY SAND
4.80	1.00	12.28	2.09		406	1.61		61.9	39.7	0.75	37.6	8.33	18.3	1093	SILTY SAND
5.00	0.80	15.04	1.59		395	1.95		67.9	39.4	0.78	37.4	12.92	27.2	1139	SANDY SILT
5.20	0.60	11.50	2.17		427	1.48		79.6	40.9	0.82	39.0	7.60	15.4	1125	SILTY SAND
	0.40	12.44	2.52		558	1.60		80.9	40.5	0.85	38.7	9.32	18.1	1511	SILTY SAND
	0.20	12.30	2.80		638	1.55		99.4	41.5	0.89	39.8	9.10	17.1	1721	SILTY SAND
5.80	0.00	18.39	1.97		699	2.32		106.3	40.4	0.91	38.7	21.49	38.7	2150	SILTY SAND
6.00	-0.20	17.59	1.34		471	2.23		103.4	40.2	0.95	38.5	20.65	35.8	1430	SANDY SILT
6.20	-0.40	14.25	1.76		520	1.85		86.7	39.6	0.98	38.0	14.51	24.3	1475	SANDY SILT
6.40	-0.60	10.48	2.45		549	1.35		96.2	40.9	1.02	39.4	7.93	12.9	1397	SILTY SAND
6.60	-0.80	11.71	1.56		403	1.57		74.5	38.9	1.03	37.4	10.89	17.2	1069	SANDY SILT
6.80	-1.00	13.34	1.67		504	1.80		66.4	37.7	1.05	36.1	14.96	22.9	1397	SANDY SILT
7.00	-1.20	18.49	1.31		568	2.49		47.9	34.6	1.06	32.9	32.56	48.3	1750	SANDY SILT
7.20	-1.40	13.18	1.44		457	1.82		51.4	35.8	1.10	34.2	16.54	23.8	1261	SANDY SILT
7.40	-1.60	13.32	0.92		302	1.86		47.3	35.1	1.12	33.5	17.74	24.9	836	SILT
7.60	-1.80	12.23	1.14		355	1.74		44.3	34.8	1.15	33.2	15.68	21.4	954	SILT
7.80	-2.00	11.66	1.01		307	1.69		38.7	33.8	1.17	32.3	15.12	20.2	812	SILT
8.00	-2.20	12.25	0.84		274	2.08	1.63					12.99	16.9	739	CLAYEY SILT
8.20	-2.40	11.22	0.82		251	1.97	1.49					11.60	14.7	654	CLAYEY SILT
8.40	-2.60	12.68	0.70		247	2.13	1.78					14.37	17.8	673	CLAYEY SILT
8.60	-2.80	11.28	0.76		245	1.98	1.58					12.25	14.9	641	CLAYEY SILT
~~8.80~~	~~-3.00~~	~~12.37~~	~~0.77~~		~~278~~	~~2.10~~	~~1.81~~					~~14.48~~	~~17.2~~	~~751~~	~~CLAYEY SILT~~
9.00	-3.20	12.27	0.55		203	2.09	1.83					14.59	16.9	548	SILTY CLAY
9.20	-3.40	11.32	0.48		165	1.99	1.69					13.13	14.9	432	SILTY CLAY
9.40	-3.60	10.76	0.45		150	1.92	1.62					12.38	13.8	387	SILTY CLAY
9.60	-3.80	10.52	0.47		158	1.90	1.60					12.19	13.3	402	SILTY CLAY
9.80	-4.00	10.13	0.51		167	1.85	1.56					11.70	12.6	419	SILTY CLAY
10.00	-4.20	7.87	0.78		203	1.58	1.16					8.05	8.5	458	CLAYEY SILT
10.20	-4.40	7.78	0.74		193	1.57	1.16					8.06	8.3	434	CLAYEY SILT
10.40	-4.60	9.05	0.53		163	1.73	1.43					10.41	10.5	391	SILTY CLAY
10.60	-4.80	9.09	0.47		150	1.73	1.47					10.66	10.6	361	SILTY CLAY
10.80	-5.00	8.35	0.68		201	1.64	1.34					9.51	9.3	467	CLAYEY SILT
11.00	-5.20	7.07	0.74		190	1.47	1.11					7.46	7.2	408	CLAYEY SILT
11.20	-5.40	7.89	0.54		158	1.58	1.30					9.02	8.5	356	SILTY CLAY
11.40	-5.60	7.21	0.77		209	1.49	1.18					7.97	7.4	453	CLAYEY SILT
11.60	-5.80	8.56	0.80		260	1.67	1.48					10.59	9.7	609	CLAYEY SILT
11.80	-6.00	9.79	0.60		227	1.81	1.78					13.27	11.9	563	SILTY CLAY
12.00	-6.20	14.71	0.35		200	2.32	3.02					25.49	22.5	572	CLAY
12.20	-6.40	9.23	0.67		249	1.75	1.72					12.52	10.9	602	CLAYEY SILT
12.40	-6.60	8.24	0.67		223	1.63	1.51					10.67	9.1	514	CLAYEY SILT
12.60	-6.80	7.84	0.68		222	1.58	1.45					10.04	8.4	499	CLAYEY SILT
12.80	-7.00	7.02	0.60		176	1.47	1.28					8.56	7.1	376	SILTY CLAY
13.00	-7.20	7.09	0.74		223	1.47	1.31					8.83	7.2	480	CLAYEY SILT

$\bar{M}_1 = 995$ tsf

(H)

Clay & Silt

$\bar{M}_2 = 488$ tsf

(24.4'- 299.2")

17a

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)
In-Situ Soil Testing, L.C.
JOB FILE: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew
Z   BY : Roger Failmezger

SNDG. NO. : P-10
Page 2b
FILE NO. :2007-25

SNDG. DATE: 04/21/07
ANAL. DATE: 04/27/07

```
ANALYSIS PARAMETERS:  LO RANGE    =  8.50 BARS  ROD DIAM.    =   4.4 CM    BL.THICK.   =  15.0 MM    SU  FACTOR = 1
SURF.ELEV.   =    5.8 M LO  GAGE 0 = -0.04 BARS  FR.RED.DIA. =   5.8 CM    BL.WIDTH    =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =    0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT. =   8.0 KGF/M DELTA-A     =  0.12 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS  DELTA / PHI =   0.5       DELTA-B =  0.35 BARS     M FACTOR = 1
MAX SU ID   =    0.9   SU OPTION   =     0      MIN PHI ID  =   0.9       OCR OPTION =     0         KO FACTOR  = 1
UNIT CONVERSIONS:      1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT
```

(H)

Z (M)	ELEV (M)	KD	ID	UD	ED (BAR)	KO	SU (BAR)	QD (BAR)	PHI (DEG)	SIGFF (BAR)	PHIO (DEG)	PC (BAR)	OCR	M (BAR)	SOIL TYPE
13.20	-7.40	7.73	0.56		187	1.56	1.48					10.26	8.2	418	SILTY CLAY
13.40	-7.60	7.47	0.53		172	1.53	1.44					9.86	7.8	379	SILTY CLAY
13.60	-7.80	9.45	0.42		176	1.78	1.96					14.44	11.3	430	SILTY CLAY
13.80	-8.00	8.28	0.55		205	1.63	1.69					11.90	9.2	473	SILTY CLAY
14.00	-8.20	10.43	0.13		63	1.89	2.28					17.29	13.1	160	CLAY
14.20	-8.40	9.22	0.51	0.03	216	1.75	1.98					14.46	10.8	522	SILTY CLAY
14.40	-8.60	9.83	0.45		209	1.82	2.17					16.19	12.0	518	SILTY CLAY
14.60	-8.80	8.84	0.59		249	1.70	1.93					13.91	10.2	591	SILTY CLAY
14.80	-9.00	9.05	0.61		265	1.73	2.02					14.63	10.5	636	CLAYEY SILT
15.00	-9.20	8.79	0.47		203	1.70	1.97					14.18	10.1	481	SILTY CLAY
15.20	-9.40	8.75	0.44		192	1.69	1.98					14.25	10.0	455	SILTY CLAY
15.40	-9.60	8.51	0.48		205	1.66	1.94					13.82	9.6	479	SILTY CLAY
15.60	-9.80	9.31	0.39		183	1.76	2.20					16.08	11.0	445	SILTY CLAY
15.80	-10.00	9.14	0.46		214	1.74	2.18					15.85	10.7	516	SILTY CLAY
16.00	-10.20	9.07	0.45		214	1.73	2.19					15.88	10.6	514	SILTY CLAY
16.20	-10.40	8.70	0.43		198	1.68	2.10					15.05	9.9	466	SILTY CLAY
16.40	-10.60	7.96	0.56		238	1.59	1.90					13.27	8.6	539	SILTY CLAY
16.60	-10.80	8.34	0.45		203	1.64	2.04					14.43	9.3	470	SILTY CLAY
16.80	-11.00	8.78	0.47		223	1.69	2.20					15.83	10.1	529	SILTY CLAY
17.00	-11.20	9.25	0.44		225	1.75	2.38					17.39	10.9	545	SILTY CLAY
17.20	-11.40	9.09	0.44		223	1.73	2.36					17.14	10.6	537	SILTY CLAY
17.40	-11.60	9.23	0.38		198	1.75	2.43					17.78	10.9	478	SILTY CLAY
17.60	-11.80	8.86	0.40		201	1.70	2.34					16.88	10.2	479	SILTY CLAY
17.80	-12.00	8.59	0.35		172	1.67	2.28					16.28	9.7	404	CLAY
18.00	-12.20	8.40	0.41		201	1.65	2.24					15.90	9.4	468	SILTY CLAY
18.20	-12.40	8.23	0.40		196	1.63	2.21					15.60	9.1	451	SILTY CLAY
1	-12.60	9.23	0.39		216	1.75	2.58					18.87	10.9	522	SILTY CLAY
1	-12.80	9.91	0.29		172	1.83	2.86					21.34	12.1	429	CLAY
18.80	-13.00	8.85	0.41		223	1.70	2.51					18.08	10.2	530	SILTY CLAY
19.00	-13.20	8.08	0.41		205	1.61	2.27					15.88	8.8	468	SILTY CLAY
19.20	-13.40	7.45	0.39		183	1.52	2.07					14.15	7.8	403	SILTY CLAY
19.40	-13.60	8.32	0.41		220	1.64	2.40					16.96	9.2	508	SILTY CLAY
19.60	-13.80	8.28	0.38		203	1.63	2.41					17.04	9.2	469	SILTY CLAY
19.80	-14.00	7.75	0.42		214	1.56	2.24					15.52	8.3	479	SILTY CLAY
20.00	-14.20	7.32	0.49		234	1.51	2.11					14.37	7.6	511	SILTY CLAY
20.20	-14.40	8.26	0.40		218	1.63	2.49					17.53	9.1	502	SILTY CLAY
20.40	-14.60	8.05	0.34		187	1.60	2.43					17.04	8.8	426	CLAY
20.60	-14.80	7.43	0.42		212	1.52	2.22					15.19	7.7	466	SILTY CLAY
20.80	-15.00	7.15	0.42		205	1.48	2.14					14.44	7.3	442	SILTY CLAY
21.00	-15.20	6.81	0.45		211	1.44	2.04					13.53	6.8	444	SILTY CLAY
21.20	-15.40	7.14	0.37		185	1.48	2.18					14.73	7.3	399	SILTY CLAY
21.40	-15.60	6.67	0.41		194	1.42	2.02					13.36	6.5	405	SILTY CLAY
21.60	-15.80	7.23	0.38		198	1.49	2.26					15.28	7.4	429	SILTY CLAY
21.80	-16.00	6.46	0.46		212	1.39	1.98					12.97	6.2	436	SILTY CLAY
22.00	-16.20	6.70	0.38		187	1.42	2.09					13.84	6.6	390	SILTY CLAY
22.20	-16.40	7.47	0.35		194	1.53	2.42					16.56	7.8	428	SILTY CLAY
22.40	-16.60	6.89	0.34		176	1.45	2.21					14.73	6.9	373	CLAY
22.60	-16.80	7.18	0.35		187	1.49	2.35					15.86	7.3	404	CLAY
22.80	-17.00	6.11	0.37		172	1.33	1.93					12.43	5.7	344	SILTY CLAY
23.00	-17.20	6.15	0.33		154	1.34	1.97					12.67	5.8	308	CLAY
23.20	-17.40	6.50	0.31		154	1.39	2.13					13.92	6.3	317	CLAY
23.40	-17.60	5.53	0.39		169	1.25	1.75					10.92	4.9	319	SILTY CLAY
23.60	-17.80	6.21	0.30		147	1.35	2.04					13.16	5.8	295	CLAY
23.80	-18.00	6.43	0.30		154	1.38	2.15					14.02	6.2	316	CLAY
24.00	-18.20	6.90	0.33		180	1.45	2.37					15.78	6.9	381	CLAY
24.20	-18.40	6.71	0.44		236	1.42	2.30					15.24	6.6	494	SILTY CLAY
24.40	-18.60	5.70	0.35		161	1.27	1.90					11.92	5.1	311	SILTY CLAY
24.60	-18.80	6.32	0.34		176	1.37	2.17					14.12	6.0	357	CLAY
24.80	-19.00	6.40	0.29		154	1.38	2.23					14.51	6.1	315	CLAY
25.00	-19.20	6.43	0.27		143	1.38	2.26					14.75	6.2	293	CLAY
25.20	-19.40	5.74	0.37		176	1.28	1.97					12.41	5.2	340	SILTY CLAY
25.40	-19.60	6.77	0.38		216	1.43	2.45					16.23	6.7	454	SILTY CLAY
25.60	-19.80	7.44	0.37		231	1.52	2.77					18.94	7.8	507	SILTY CLAY
25.80	-20.00	6.95	0.31		183	1.46	2.57					17.17	7.0	390	CLAY
26.00	-20.20	7.57	0.51		333	1.54	2.88					19.77	8.0	737	SILTY CLAY

M2 Cont'd
(24.9' = 298.8") 2

SM
$\bar{M}_3$ = 510 tsf ✓
(6.6' = 78.74")

CL
$\bar{M}_4$ = 493 tsf ✓
(6.6' = 78.74")

SP Sand
$\bar{M}_5$ = 445 ✓
(5.9' = 70.87")

Clay
$\bar{M}_6$ = 367 ✓
(7.9' = 94.5")

SM
$\bar{M}_7$ = 524 tsf ✓
(7.2' = 86.61")

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DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)        SNDG. NO. : P-10
In-Situ Soil Testing, L.C.                                                              Page 3b
JOB FILE: Suffolk Regional Landfill                                                     FILE NO. :2007-25
LOCATION: Suffolk, Virginia
SNDG.BY : B. Delano, D. Drew                                                            SNDG. DATE: 04/21/07
A`   BY : Roger Failmezger                                                              ANAL. DATE: 04/27/07

ANALYSIS PARAMETERS:  LO RANGE     =  8.50 BARS  ROD DIAM.    =   4.4 CM     BL.THICK.   =  15.0 MM     SU  FACTOR = 1
SURF.ELEV.  =    5.8 M LO  GAGE 0 = -0.04 BARS  FR.RED.DIA.  =   5.8 CM     BL.WIDTH    =  96.0 MM    PHI FACTOR = 1
WATER DEPTH =    0.6 M HI  GAGE 0 =  0.00 BARS  LIN.ROD WT.  =   8.0 KGF/M DELTA-A     =  0.12 BARS   OCR FACTOR = 1
SP.GR.WATER = 1.000    CAL GAGE 0 =  0.00 BARS   DELTA / PHI =   0.5       DELTA-B =  0.35 BARS       M FACTOR = 1
MAX SU ID   =    0.9   SU OPTION   =     0       MIN PHI ID  =   0.9       OCR OPTION =     0           KO FACTOR  = 1
UNIT CONVERSIONS:      1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI     1 M = 3.2808 FT

  Z     ELEV     KD    ID    UD     ED      KO     SU     QD    PHI   SIGFF   PHIO    PC     OCR      M     SOIL TYPE
 (M)     (M)                       (BAR)          (BAR)  (BAR)  (DEG)  (BAR)  (DEG)  (BAR)           (BAR)
***** ******  ***** ***** ***** ******  *****  *****  *****  *****  ******  *****  *****  *****  ******  ************
26.20 -20.40   7.30  0.41           260   1.50   2.77                                18.84    7.5     566  SILTY CLAY
26.40 -20.60   6.56  0.42           243   1.40   2.45                                16.10    6.4     503  SILTY CLAY
26.60 -20.80   7.52  0.50           333   1.53   2.93                                20.06    7.9     734  SILTY CLAY
26.80 -21.00   8.09  0.42           300   1.61   3.23                                22.68    8.8     684  SILTY CLAY
27.00 -21.20   7.27  0.50           329   1.50   2.85                                19.34    7.5     715  SILTY CLAY
27.20 -21.40   6.94  0.51           318   1.45   2.71                                18.14    7.0     676  SILTY CLAY
27.40 -21.60   5.99  0.34           183   1.32   2.28                                14.55    5.5     362  CLAY
27.60 -21.80   6.14  0.29           165   1.34   2.37                                15.22    5.8     330  CLAY
27.80 -22.00   5.84  0.39           209   1.29   2.24                                14.18    5.3     407  SILTY CLAY
28.00 -22.20   5.51  0.34           172   1.24   2.10                                13.04    4.9     325  CLAY
28.20 -22.40   5.72  0.32           172   1.28   2.21                                13.93    5.1     332  CLAY
28.40 -22.60   5.05  0.35           165   1.17   1.91                                11.56    4.2     297  CLAY
28.60 -22.80   4.84  0.46           212   1.13   1.82                                10.89    4.0     373  SILTY CLAY
28.80 -23.00   4.53  0.41           180   1.08   1.69                                 9.88    3.6     303  SILTY CLAY
29.00 -23.20   4.77  0.42           194   1.12   1.81                                10.80    3.9     338  SILTY CLAY
29.20 -23.40   5.22  0.32           163   1.20   2.04                                12.48    4.5     299  CLAY
29.40 -23.60   5.06  0.37           183   1.17   1.98                                11.97    4.3     330  SILTY CLAY
29.60 -23.80   4.63  0.55           252   1.10   1.78                                10.50    3.7     432  SILTY CLAY
29.80 -24.00   5.07  0.39           198   1.17   2.01                                12.20    4.3     357  SILTY CLAY
30.00 -24.20   4.44  0.46           201   1.07   1.71                                 9.97    3.5     336  SILTY CLAY
30.20 -24.40   5.24  0.37           192   1.20   2.12                                12.99    4.5     353  SILTY CLAY
30.40 -24.60   5.63  0.36           205   1.26   2.34                                14.66    5.0     392  SILTY CLAY
30.60 -24.80   5.75  0.38           223   1.28   2.42                                15.24    5.2     432  SILTY CLAY
```

(H)

5M

Chalk

$\bar{M}_8$ = 400 tsf /

(92.5'
=-149.6')

17c

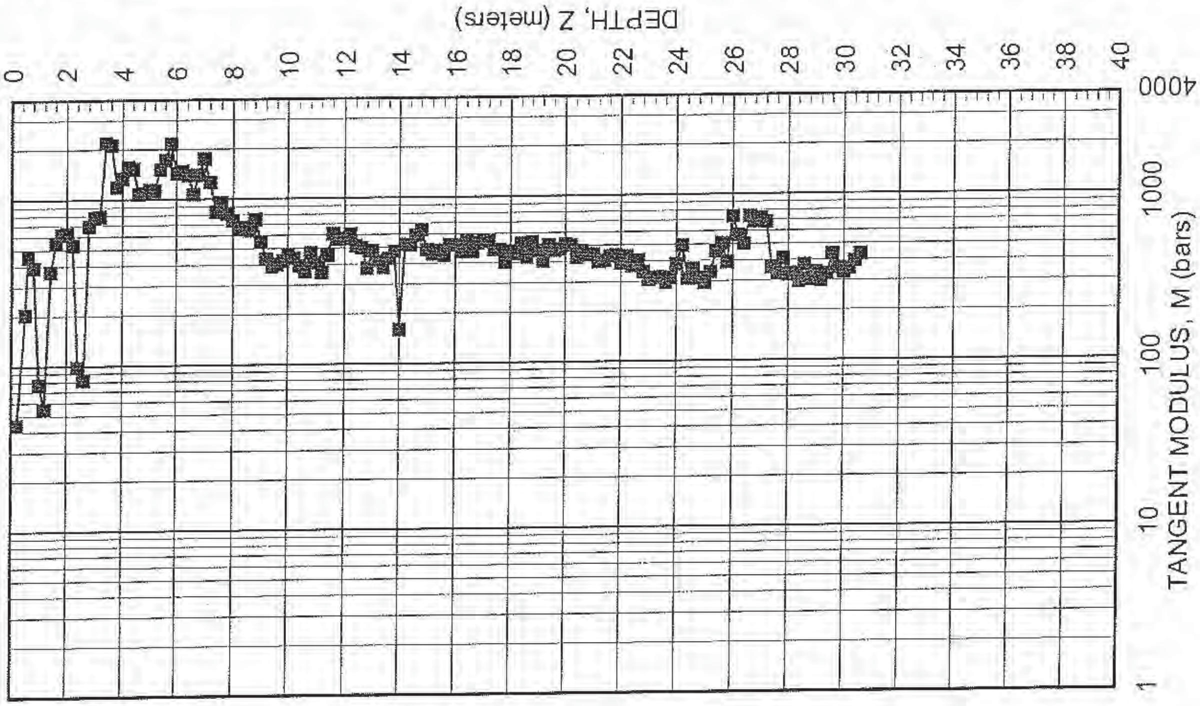
PROJECT: Suffolk Regional Landfill
LOCATION: Suffolk, Virginia

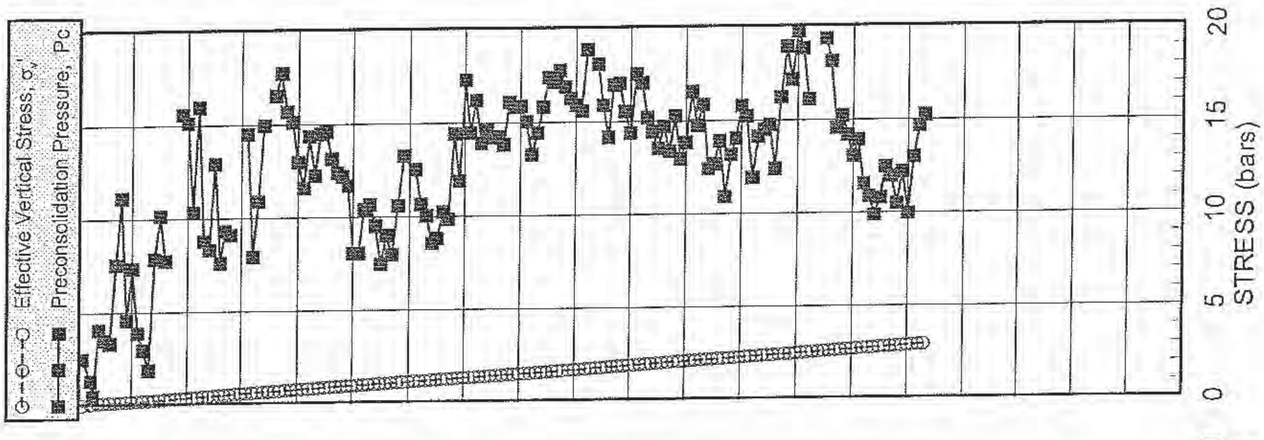
IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
SOUNDING DATE: 4/26/07

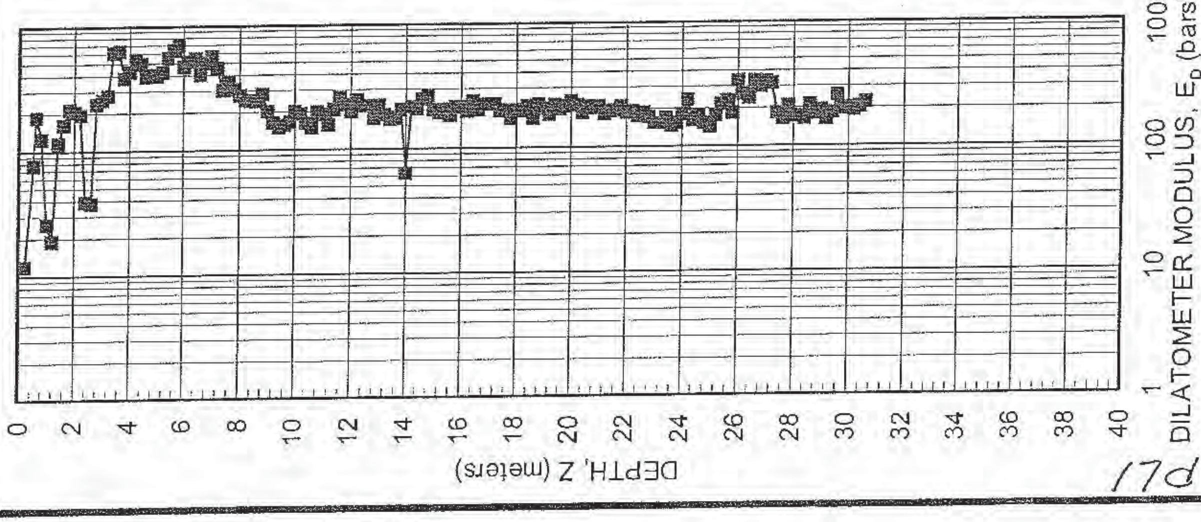
SOUNDING
P-10

INTERPRETED DMT DEFORMATION PARAMETERS

Ground Surface Elev.: ~5.8 m
Water Depth: ~0.6 m







P17

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section C, Point 6

$S = \Delta q_s (H) / E$

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

S is the settlement at level n

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results
E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-10 to 100 feet

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
41	156	488	0.3	363	1.3	0.4	0.7	3970	1.99	0.9
54	84	510	0.3	379	1.3	0.4	0.7	3907	1.95	0.4
61	72	493	0.3	366	1.3	0.4	0.7	3870	1.94	0.4
67	72	445	0.3	331	1.3	0.4	0.7	3834	1.92	0.4
73	96	367	0.3	273	1.3	0.4	0.7	3792	1.90	0.7
81	84	524	0.3	389	1.3	0.4	0.7	3750	1.88	0.4
88	144	406	0.3	302	1.3	0.4	0.7	3689	1.84	0.9
		520	0.3	386	1.3	0.4	0.7		0.00	0.0
100	1200	520	0.3	386	1.3	0.4	0.7	3293	1.65	5.1
200	1200	485	0.4	226	1.4	0.2	0.6	2916	1.46	7.7
300	1200	885	0.2	797	1.2	0.6	0.8	2658	1.33	2.0
400	1200	700	0.4	327	1.4	0.2	0.6	2448	1.22	4.5
500	6000	1475	0.2	1328	1.2	0.6	0.8	1605	0.80	3.6
1000									**Total**	27

▨ Settlement to 59 feet below the liner based on Boring P-10 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-10 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-10 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-10 DMT

▨ Settlement extrapolated from Well data & P-10 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 0.8 feet

Mattaponi Formation & Trans. Bed 0.5 feet

Calvert Formation 0.6 feet

Patuxent Formation 0.3 feet

Total Settlement 2 feet

*depth is the mid-point of the soil layer.
e.g. Z=0 feet at depth = 41 feet

SPSA Regional Landfill
Proposed Cell VII

Computed: T. Hunkele
Checked: ~~A. Engineer~~ DES
August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section C, Point 5

$S = \Delta q_s (H) / E$

$E = M (1+\mu) (1-2\mu) / (1-\mu)$

S is the settlement at level n

H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results
E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Boring P-10 to 100 feet

Top ./Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
0	336	995	0.3	739	1.3	0.4	0.7	300	0.15	0.1
28	312	488	0.3	363	1.3	0.4	0.7	600	0.30	0.3
54	84	510	0.3	379	1.3	0.4	0.7	659	0.33	0.1
61	72	493	0.3	366	1.3	0.4	0.7	681	0.34	0.1
67	72	445	0.3	331	1.3	0.4	0.7	704	0.35	0.1
73	96	367	0.3	273	1.3	0.4	0.7	730	0.37	0.1
81	84	524	0.3	389	1.3	0.4	0.7	756	0.38	0.1
88	144	406	0.3	302	1.3	0.4	0.7	793	0.40	0.2
100	1200	520	0.3	386	1.3	0.4	0.7	974	0.49	1.5
200	1200	485	0.4	226	1.4	0.2	0.6	1215	0.61	3.2
300	1200	885	0.2	797	1.2	0.6	0.8	1265	0.63	1.0
400	1200	700	0.4	327	1.4	0.2	0.6	1306	0.65	2.4
500	6000	1475	0.2	1328	1.2	0.6	0.8	1295	0.65	2.9
1000									**Total**	12

▨ Settlement to 100 feet below the ground surface based on Boring P-10 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-10 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-10 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-10 DMT

▨ Settlement extrapolated from Well data & P-10 DMT to 1000 feet in Patuxent Formation

Yorktown Formation 0.2 feet
Mattaponi Formation & Trans. Bed 0.3 feet
Calvert Formation 0.3 feet
Patuxent Formation 0.2 feet
Total Settlement 1 feet

*depth is the mid-point of the soil layer
e.g. Z=14 feet at depth = 14 feet

Computed: T. Hunkele
Checked: ~~A Engineer~~ DES

August, 2008

Dr. John H. Schmertmann, 1988 Report No. FHWA-PA-87-024+84-24

SETTLEMENT FROM DMT RESULTS FOR CELL VII

Section B, Point 1B

$S = \Delta q_s (H) / E$

$E = M (1+\mu)(1-2\mu) / (1-\mu)$

Boring P-12 to 100 feet

S is the settlement at level n
H is the soil layer thickness
M is the Tangent Modulus derived from DMT Results
E is the drained Young's Modulus of Elasticity
μ is the drained Poisson Ratio for the soil type in layer n
Δq_s is the average bearing pressure increase at level n

Top /Soil Layer (feet)	H (inches)	M Dmt (tsf)	μ Layer Soil	E (tsf)	$(1+\mu)$ Sand Clay	$(1-2\mu)$ Sand Clay	$(1-\mu)$ Sand Clay	Δq_s at depth* (psf)	Δq_s Average (tsf)	S (inches)
0		630	0.3	468	1.3	0.4	0.7	5985	2.99	0.0
12		1270	0.3	943	1.3	0.4	0.7	5580	2.79	0.0
20		830	0.3	617	1.3	0.4	0.7	5366	2.68	0.0
31		485	0.3	360	1.3	0.4	0.7	5209	2.60	0.0
42	312	447	0.3	332	1.3	0.4	0.7	4988	2.49	2.3
68	180	373	0.3	277	1.3	0.4	0.7	4918	2.46	1.6
83	120	430	0.3	319	1.3	0.4	0.7	4872	2.44	0.9
93	84	715	0.3	531	1.3	0.4	0.7	4844	2.42	0.4
100	1200	700	0.3	520	1.3	0.4	0.7	4655	2.33	5.4
200	1200	490	0.4	229	1.4	0.2	0.6	4326	2.16	11.4
300	1200	550	0.2	495	1.2	0.6	0.8	4046	2.02	4.9
400	1200	540	0.4	252	1.4	0.2	0.6	3765	1.88	9.0
500	6000	1440	0.2	1296	1.2	0.6	0.8	2967	1.48	6.9
1000									**Total**	43

▨ Settlement to 100 feet below the ground surface based on Boring P-12 & DMT Results

▨ Settlement from the remaining Yorktown Formation based on Well # W2106 & P-12 DMT

▨ Settlement from the Clay of the Calvert Formation based on Well # W2106 & P-12 DMT

▨ Settlement of Sand & Clay of the Mattaponi etc. Formation - Well # W2106 & P-12 DMT

▨ Settlement extrapolated from Well data & P-12 DMT to 1000 feet in Patuxent Formation

Yorktown Formation	0.9 feet	Mattaponi Formation & Trans. Beds	1.2 feet
Calvert Formation	1 feet	Patuxent Formation	0.6 feet
		Total Settlement	4 feet

*depth at mid-point of soil layer.
e.g. Z=0 feet at depth = 42 feet

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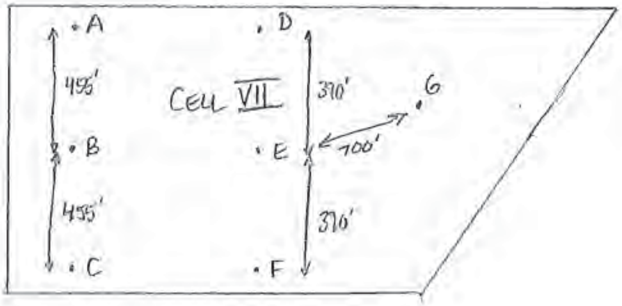
Project: SPSA REGIONAL LANDFILL	Computed: DTD	Date: 8/27/08
Subject: CELL VII PART B APPLICATION	Checked:	Date:
Task: SUBGRADE SETTLEMENT	Page: 1	of: 1
Job #:	No:	

SETTLEMENT SUMMARY

REF: ATTACHED ESTIMATE OF SETTLEMENTS
PROPOSED CELL VII SUBGRADE AND FINAL GRADE CONTOURS

TOTAL ESTIMATED SETTLEMENT



$\delta_A = 46''$ $\delta_D = 43''$

$\delta_B = 59''$ $\delta_E = 56''$ $\delta_G = 27''$

$\delta_C = 46''$ $\delta_F = 43''$

$$\delta_{A\to B} = \delta_{B\to C} = \frac{4.9' - 3.8'}{455} = 0.00242 \text{ FT/FT} = 0.24\%$$

$$\delta_{D\to E} = \delta_{E\to F} = \frac{4.8' - 3.6'}{390'} = 0.00308 \text{ FT/FT} = 0.31\%$$

$$\delta_{G\to E} = \frac{4.8' - 2.3'}{650'} = 0.00385 \text{ FT/FT} = 0.38\%$$

SUBGRADE SHOULD BE A MINIMUM OF 2.38% TO ACCOMODATE DIFFERENTIAL SETTLEMENT.

SOIL LOSS

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HDR Computation

Job Number	01743-077-018			No.	
Project	SPSA Regional Landfill	Computed	GMW	Date	7/10/2008
Subject	Cell VII Part B Permit Application	Checked	DM	Date	8/26/08
Task	Soil Loss Equation	Sheet	1	Of	

Objective: Predict the soil loss from a slope based on the Revised Universal Soil Loss Equation.

References: 1. Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE), K.G. Renard, G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, U.S. Government Printing Office, ISBN.

2. Handbook of Nonpoint Pollution, Sources and Management, Vladimir Novotny and Gordon Chesters.

3. RUSLE program 1.06b

Calculations: RUSLE:

A = R x K x LS x C x P

Where:

A = Annual soil loss (ton/ac/year)
R = Regional rainfall and erosivity index
K = Soil erodibility index
L = Slope length factor
S = Slope angle factor
C = Cover managing factor
P = Crop support practice factor (=1)

Assumptions:

1. Rainfall data from Norfolk, Va.
2. 0% rock cover.
3. Soil is made up of 33% silt and fine sand; 10% clay.
4. Moderately low runoff potential
5. Slow to moderate permeability.
6. Moderate vegetative cover.
7. Ground has 70% vegetative cover.
8. Benches are spaced every 40 vertical feet

RUSLE 1.06c Output:

Location	R	K	LS	C	P	A (tons/acre/year)	
Cell VII Expansion	250	0.129	5.85	0.0144	1	2.7	(see notes)

Notes:

1. Typical tolerance for a landfill cap is approximately 3.0 tons/acre/year according to George Foster (USDA-Agricultural Research Service).
2. Rill erosion is assumed to begin to become intense when the erosion rate becomes greater than 7 tons/acre/year.

VENEER STABILITY

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HDR Computation

Job Number	01743-02889-018	No.	
Project	SPSA Regional Landfill		
Subject	Cell VII Part B Permit Application		
Task	Operational Cover Veneer Stability		
Computed	GMW	Date	8/19/2008
Checked	JMW	Date	8/21/2008
Sheet	1	Of	

Objective: Determine the operational cover stability due to sliding for a 4H:1V slope.

References:
1. "Designing with Geosynthetics"; Robert M. Koerner
2. "Waste Containment Systems, Waste Stabilization, and Landfills"; Hari D. Sharma and Sangeeta P. Lewis

Calculations: Finite Slope Analysis

Active:

$W_A = \gamma h^2 (L/h - 1/\sin\beta - \tan\beta/2)$

$N_A = W_A \cos\beta$

$C_a = c_a (L - h/\sin\beta)$

$a = (W_A - N_A \cos\beta) \cos\beta$

$b = -[(W_A - N_A \cos\beta) \sin\beta \tan\phi + (N_A \tan\delta + C_a) \sin\beta \cos\beta + \sin\beta (C + W_P \tan\phi)]$

$c = (N_A \tan\delta + C_a) \sin^2\beta \tan\phi$

$$C = \frac{c\,h}{\sin\beta}$$

$$FS = \frac{-b + (b^2 - 4ac)^{0.5}}{2a}$$

Passive:

$$W_P = \frac{\gamma h^2}{\sin 2\beta}$$

Where:

W_A = total weight of active wedge
W_P = total weight of passive wedge
N_A = effective force normal to the failure plane of the active wedge
γ = unit weight of cover soil
h = thickness of cover soil
L = length of slope measured along the geosynthetic
β = soil slope angle beneath the geosynthetic
ϕ = friction angle of cover soil
δ = interface friction angle between cover soil and geosynthetic
c_a = adhesive force between cover soil of the active wedge and the geosynthetic
C = cohesive force along the failure plane of the of the passive wedge
c = cohesion of cover soil

Given:

γ =	105	lb/ft³	
h =	18	in	
Slope, M =	4	H:1V	
Berm Height, H =	43.0	ft	It is assumed operational cover will be placed on entire sideslope without staging.
L =	177.3	ft	
β =	14.0	degrees	
ϕ =	28	degrees	Assumed
δ =	21.0	degrees	Minimum required geosynthetic friction angle from slope stability analyses
c_a =	0	lb/ft²	Assumed (very conservative)
c =	0	lb/ft²	Assumed granular material

Solution:

W_A =	26,920	lb/ft²
N_A =	26,116	lb/ft²
C_a =	0	lb/ft²
W_P =	502	lb/ft²
C =	0	lb/ft
a =	1,536	lb/ft²
b =	-2,628	lb/ft²
c =	314	lb/ft²

FS = 1.6

Factor of Safety is greater than 1.5. OK

HDR Computation

Job Number 01743-02889-018 **No.**

Project SPSA Regional Landfill
Subject Cell VI Part B Permit Application
Task Final Cover Veneer Stability (3:1 Sideslope)

Computed GMW **Date** 8/19/2008
Checked **Date** 8/21/2008
Sheet 1 **Of**

Objective: Determine the final cover stability due to sliding for a 3H:1V slope.

References: 1. Matasovic, N. (1991), "Selection of Method for Seismic Slope Stability Analysis," Proc. 2nd International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, St. Louis, Vol. 2, pp. 1057-1062.

Calculations: Infinite slope:

$$FS = \frac{\text{Resisting Moment (RM)}}{\text{Driving Moment (DM)}}$$

$$FS = \frac{[c/(\gamma z\cos^2\beta) + \tan\delta[1 - \gamma_w(z - d_w)/(\gamma z)] - k_g\tan\beta]}{k_g + \tan\beta}$$

Where:
FS = Factor of Safety
k_g = seismic coefficient (=0 for static stability)
γ = unit weight of cover soil
c = cohesion of cover soil
γ_w = unit weight of water
z = depth to failure surface
d_w = depth to seepage surface (=z if slope is dry)
β = slope angle of cover
δ = interface friction angle

FS_{min} = 1.5 Static conditions
FS_{min} = 1.0 Dynamic conditions

Given:
γ = 105 lb/ft^3
z = 2.0 ft
Slope, M = 3 H:1V
c = 50.0 lb/ft^2 as required for vegetative soil specs
Water Depth = 2.00 ft assume geocomposite will be designed to avoid lateral seepage forces in cover soils.
β = 18.4 degrees

Ground surface acceleration = 0.00 (landfill is not located in seismic impact zone)
= 0 (static)

Static FS Against Sliding:

δ	RM	DM	FS
25.00	0.731	0.3333	2.19

FS>1.5, OK

Note: δ was input as 25° which is the minimum required friction angle for the geosynthetic components of the final cover system.

HDR Computation

Job Number	01743-02889-018			No.	
Project	SPSA Regional Landfill	Computed	GMW	Date	8/19/2008
Subject	Cells I-IV Closure	Checked	JMG	Date	8/21/2008
Task	Final Cover Veneer Stability (5% top slope)	Sheet	1	Of	

Objective: Determine the final cover stability due to sliding for the 5% top slope.

References: 1. Matasovic, N. (1991), "Selection of Method for Seismic Slope Stability Analysis," Proc. 2nd International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, St. Louis, Vol. 2, pp. 1057-1062.

Calculations: Infinite slope:

$$FS = \frac{\text{Resisting Moment (RM)}}{\text{Driving Moment (DM)}}$$

$$FS = \frac{[c/(\gamma z\cos^2\beta) + \tan\delta[1 - \gamma_w(z - d_w)/(\gamma z)] - k_g\tan\beta]}{k_g + \tan\beta}$$

Where:

FS = Factor of Safety

k_g = seismic coefficient (=0 for static stability)

γ = unit weight of cover soil

c = cohesion of cover soil

γ_w = unit weight of water

z = depth to failure surface

d_w = depth to seepage surface (=z if slope is dry)

β = slope angle of cover

δ = interface friction angle

FS_{min} = 1.5 Static conditions

FS_{min} = 1.0 Dynamic conditions

Given:

γ =	105	lb/ft^3	
z =	2.0	ft	
Slope, M =	20	H:1V	
c =	50.0	lb/ft^2	as required for vegetative soil specs
Water Depth =	0.00	ft	assume cover soil fully saturated (i.e. water depth at top of cover soil)
β =	2.9	degrees	

Ground surface acceleration = 0.00 (seismic coefficient; landfill is not located in seismic impact zone)

= 0 (static)

Static FS Against Sliding:

δ	RM	DM	FS
25	0.428	0.0500	8.56

FS>1.5 OK

Note: δ was input as 25° which is the minimum required friction angle for the geosynthetic components of the final cover system.

ANCHOR TRENCH

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HDR Computation

Job Number 01743-02889-018

No.

Project SPSA Regional Landfill

Subject Cell VII Part B Permit Application

Task Design Anchor Trench

Computed GMW

Date 6/13/2008

Checked

Date 8/26/08

Sheet 1 **Of** 1

Objective: Determine the required runout length for the geomembrane to the anchor trench.

Reference: Ref 1. Koerner, Robert M., "Designing with Geosynthetics," Prentice Hall, Upper Saddle River, New Jersey, 4th edition, pp. 487-491.
Ref 2. EPA Design Guidance Document, "Geosynthetic Design Guidance for Hazardous and Municipal Solid Waste Landfills"

Given Parameters:

Operational Cover Unit Weight = 110 lb/ft3
Slope = 4 horizontal to 1 vertical
Soil Friction Angle = 28
$T_{GMALLOW}$ should be greater than the maximum tensile strength exhibited in the Geosynthetic Stresses calcs (note stress calcs. indicate sideslope geosynthetics will not be under stress).

Calculations: *Runout and Vertical Trench:*

L_{RO} = 5.62 ft
$T_{GMALLOW}$ = 821 lb/ft Greater than maximum tensile strength exhibited in the Geosynthetic Stresses cal
RF = 1.4 Reduction Factor to prevent geomembrane from tearing.
σ_{ULT} = 11,000 kPa (Ref. 1, Page 427)
σ_{ULT} = 1,597 psi
σ_{ALLOW} = 1,140 psi
t = 0.060 inches (60mil HDPE)
β = 4.0 slope, X:1
β = 14.04 slope, degrees
cover soil thickness = 1.5 ft
density of cover soil = 110 lb/ft^3
δ_U = 0.0 Assumes the soil will move with the geomembrane as it deforms.
δ_L = 21.0 degrees (textured HDPE geomembrane to Soil)
K_p = 2.8
K_a = 0.36
d_{AT} = 1.00 ft

Where:

$T_{GMALLOW}$ = allowable force in geomembrane stress = $\sigma_{ALLOW}t$, where
σ_{ALLOW} = allowable stress in geomembrane, and
$T_{ATALLOW}$ = allowable tension in the anchor trench
t = thickness of geomembrane;
β = side slope angle;
L_{RO} = horizontal length of geomembrane runout
δ_U = angle of shearing resistance between geomembrane and upper material; and

δ_L = angle of shearing resistance between geomembrane and underlying material; and
d_{AT} = depth of anchor trench
d_{cs} = depth of cover soil
γ_{cs} = unit weight of cover soil

$$T_{ATALLOW} = \frac{[(\tan\delta_U + \tan\delta_L)*(\gamma*d)]*L+(K_p-K_a)*[0.5*\gamma*d_{AT}^2+d*\gamma*d_{AT}]}{\cos\beta - \sin\beta\tan\delta_L}$$

$T_{ATALLOW}$ = 1010 lb/ft

$$AR = \frac{T_{GMALLOW}}{T_{ATALLOW}}$$

AR = 0.81 Anchorage Ratio close to 1 is optimal design.

Determining Runout length

RF	L_{RO}
1.00	9.22
1.10	7.49
1.20	6.04
1.30	4.81
1.40	3.76

*Based on keeping the anchor trench depth to 1-foot and the AR equal to 1.0

Use a **Runout Length** between **3.76 and 9.22 feet** to avoid tearing the geosynthetics.

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PIPE STRESSES

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HDR Computation

Job Number	2889	**No.**	
Project	Southeastern Public Service Authority		
Subject	Cell VII Expansion		
Task	Leachate Pipe Stresses		
Computed	GMW	**Date**	8/5/2008
Checked		**Date**	8/29/08
Sheet	1	**Of**	

Objective: Determine the leachate collection pipe stresses due to static (overburden) loads.

References: 1. Driscopipe Design Manual.

Calculations:

STATIC LOADS

Wall Crushing

$$S_A = \frac{P_T(SDR-1)}{2}$$

$$FS = \frac{1{,}500\text{ psi}}{S_A} \quad (FS >= 1.8)$$

Where:

S_A = Actual compressive stress (psi)

SDR = Standard Dimension Ratio

P_T = Total external pressure on the top of the pipe (psi)

1,500 psi = Compressive yield strength of HDPE pipe

Overburden:

Gravel Column Layer:	Thickness =	2.5	ft
	Unit Weight =	120.0	lb/ft^3
Waste & Daily Cover:	Thickness =	195.0	ft
	Unit Weight =	62.4	lb/ft^3
Compacted Infiltration Layer/Intermediate Cover:	Thickness =	2.0	ft
	Unit Weight =	105.0	lb/ft^3
Vegetative Cover Layer:	Thickness =	2.0	ft
	Unit Weight =	100.0	lb/ft^3

Maximum Vertical Stress, P_T = 89 psi

SDR	S_A (psi)	FS	Comment
11.0	447.2	3.35	Okay

Wall Buckling

$$P_C = \frac{2.32(E)}{SDR^3}$$

$$P_{CB} = 0.8(E' \times P_C)^{0.5}$$

$$FS = \frac{P_{CB}}{P_T} \quad (FS >= 1.8)$$

Where:

P_C = Hydrostatic, critical-collapse differential pressure (psi)

E = Stress and time dependent tensile modulus of elasticity (psi) (approximately 110,000 psi)

P_{CB} = Critical buckling soil pressure at the top of the pipe (psi)

E' = Soil Modulus (psi)

SDR	E (psi)	P_C (psi)	E' (psi)	P_{CB} (psi)	FS	Comment
11.0	110,000	191.74	2,000	495.40	5.54	Okay

HDR Computation

		Job Number	2889	**No.**	
Project	Southeastern Public Service Authority	**Computed**	GMW	**Date**	8/5/2008
Subject	Cell VII Expansion	**Checked**		**Date**	8/29/08
Task	Leachate Pipe Stresses	**Sheet**	1	**Of**	

Calculations:

Use SDR 11 from crushing and buckling analysis

DYNAMIC LOADS (Minimum Factor of Safety = 1.4)

Point Loads

$$P_P = \frac{3WZ^3}{2\pi Z^5}$$

Minimum Cover Soil = 18 in.

Where:

P_P = Point Load (psi)

W = 1.5 x Superimposed surface load (lb)

Z = Vertical distance from the point of load to top of pipe (ft)

Equipment	Weight (lbs)	Number of Tires	P_P (psi)	S_A (psi)	FS	Comment
950 Wheel Loader	48,628	4	26.9	134.4	11.16	Okay
627F Scraper	128,550	4	71.0	355.2	4.22	Okay
621 Scraper	118,700	4	65.6	328.0	4.57	Okay
815B Compactor	44,175	4	24.4	122.1	12.29	Okay
825C Compactor	71,429	4	39.5	197.4	7.60	Okay

Line Loads:

$$P_L = \frac{2WZ^3}{\pi Z^4}$$

Minimum Cover Soil = 18 in.

Where:

P_L = Line Load (psi)

W = 1.5 x Superimposed surface load (lb)

Z = Vertical distance from the point of load to top of pipe (ft)

Equipment	Weight (lbs)	Track Length (ft)	P_L (psi)	S_A (psi)	FS	Comment
D4H LGP (III) Bulldozer	27,500	8.58	7.1	35.4	42.34	Okay
D6H LGP (II) Bulldozer	45,400	10.67	9.4	47.0	31.90	Okay
D9R Bulldozer	106,538	11.50	20.5	102.4	14.65	Okay
953 Track Loader	37,560	7.50	11.1	55.4	27.10	Okay
963 Track Loader	48,914	8.08	13.4	66.9	22.42	Okay

Conclusion:

Minimum SDR shown here. Use SDR 11 for all piping in the landfill, which exceeds what is required.

GEOCOMPOSITE CAPACITY

- Final Cover
- Short Term LCS
- Long Term LCS

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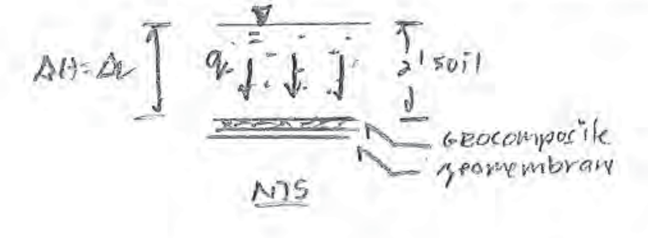
OBJECTIVE: Determine the allowable transmissivity (θallow) for the geocomposite within the final cover system of Cell VII. Use θallow in specs. for final cover geocomposite. Also determine the required transmissivity (θreqd) for the final cover geocomposite to be used in HELP Model.

ASSUMPTIONS: Use analyses as outlined in GRI-GC8 as summarized in GSE Drainage Manual, Second Edition.

Determine θreqd. using unit gradient method which conservatively assumes saturated, steady-state final cover conditions.

PROCEDURE:

Determine θreqd using unit gradient method



q = flow into geonet for unit area (say 1 ft²)

$q = k\,i\,a$ where:

k = vertical hydraulic conductivity of cover soils $= 5.2 \times 10^{-4}$ cm/sec (based on default soil #7, SM material, from HELP Model V. 3.07)

i = vertical hydraulic gradient in cover soil $= \frac{\Delta H}{\Delta L}$ where:

ΔH = Driving head in soil = 2' (assuming saturated).

ΔL = thickness of soil = 2'

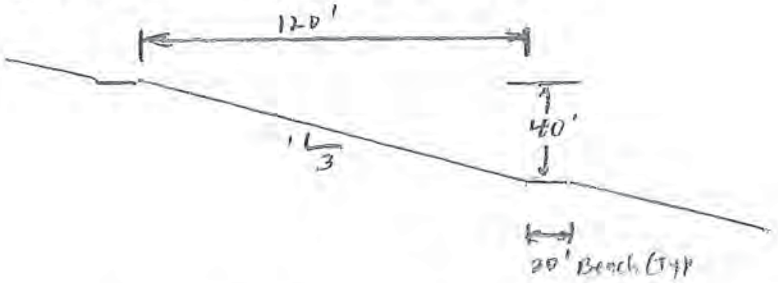
$\therefore \Delta H / \Delta L = 2/2 = 1$ (i.e. unit gradient).

a = unit area of flow into geocomposite

$\therefore q = k\,i\,a$ $\quad k = 5.2 \times 10^{-4}$ cm/sec $= 2.0 \times 10^{-4}$ in/sec $= 1.7 \times 10^{-5}$ ft/sec

$\therefore q = 1.7\times10^{-5}\,ft/sec\,(1)(1\,ft^2) = \underline{1.7\times10^{-5}\,ft^3/sec}/ft^2$

Length between final cover berms:



Assume geonet will daylight at each berm, ∴ contributing length of slope that discharges to berm = L

$L = \sqrt{(120)^2 + 40^2} + 20' = 146.5\ ft$

Flow per unit width of geocomposite = Q = qL

$\therefore Q = 1.7\times10^{-5}\,ft^3/sec/ft^2\,(146.5\,ft) = 2.5\times10^{-3}\,ft^3/sec/ft$

Calculate required hydraulic conductivity of geocomposite (K_{reqd}):

$Q = kia \rightarrow K_{reqd.} = \frac{Q}{ia}$ where:

i = hydraulic gradient = slope = $\frac{\Delta h}{\Delta L} = \frac{1}{3} = 0.33$

a = flow area of geocomposite assuming unit width = 1'

(assume thickness = 300 mil = 0.30 in = 0.025 ft²)

$\therefore K_{reqd} = \frac{2.5\times10^{-3}\,ft^3/sec/ft}{(0.33)(0.025\,ft^2)} = 0.30\ ft/sec = \underline{9.2\ cm/sec}$

Calculate required transmissivity of geocomposite (Θ_{reqd}):

$\Theta_{reqd} = K_{reqd}\,(b_{reqd})$ where $b_{reqd.}$ = thickness of geocomposite after long-term creep is accounted for.

Assume 2' of soil cover over geocomposite @ 120 lb/ft³

σ_v = vertical stress over geocomposite = $120\ lb/ft^3\,(2\,ft) = 240\ lb/ft^2$

From Att. A, 300 mil GSE HyperNet UF will retain ≈ 98% of its thickness @ 100 hrs and σ_v = 1,000 psf.

$\therefore b_{reqd} = 0.98(300\text{mil}) = 294\text{ mil} = 0.294\text{ in} = 0.75\text{cm} = 0.0075\text{m}$

$\therefore \theta_{reqd} = K_{reqd}(b_{reqd}) = 9.2\text{ cm/sec}(0.75\text{cm}) = 6.9\text{ cm}^2\text{/sec}$
$= \underline{6.9 \times 10^{-4}\text{ m}^2\text{/sec}}$

Determine θ_{allow} from GRI GC8:

$\theta_{allow} = \theta_{req} \cdot FS_D \cdot RF_{CR} \cdot RF_{CC} \cdot RF_{BC}$

where: θ_{allow} = specified transmissivity of geocomposite (index)
FS_D = overall factor of safety for drainage = 2.0 based on GSE Manual recommendations.
RF_{CR} = reduction factor for long-term creep = 1.0 (see Att. A)
RF_{CC} = reduction factor for chemical clogging = 1.0 based on GSE Manual recommendations (no high alkalinity soils present).
RF_{BC} = reduction factor for biological clogging = 1.2 based on GSE Manual recommendations.

$\therefore \theta_{allow} = 6.9 \times 10^{-4}\text{ m}^2\text{/sec}(2.0)(1.0)(1.0)(1.2) = \boxed{1.7 \times 10^{-3}\text{ m}^2\text{/sec}}$

From Att. B, 300 mil GSE HyperNet UF at $i = 0.33$ and $\sigma_v = 1{,}000$ psf has $\theta = 2 \times 10^{-3}\text{ m}^2\text{/sec} > [\theta_{allow} \doteq 1.7 \times 10^{-3}\text{ m}^2\text{/sec}]$ <u>Ok</u>

CONCLUSIONS: Use 300 mil GSE HyperNet UF or similar Geocomposite for final cover. Use $k_{req} = 9.2$ cm/sec and thickness = 0.294 in for final cover geocomposite in HELP Model analyses.

ATTACHMENT A

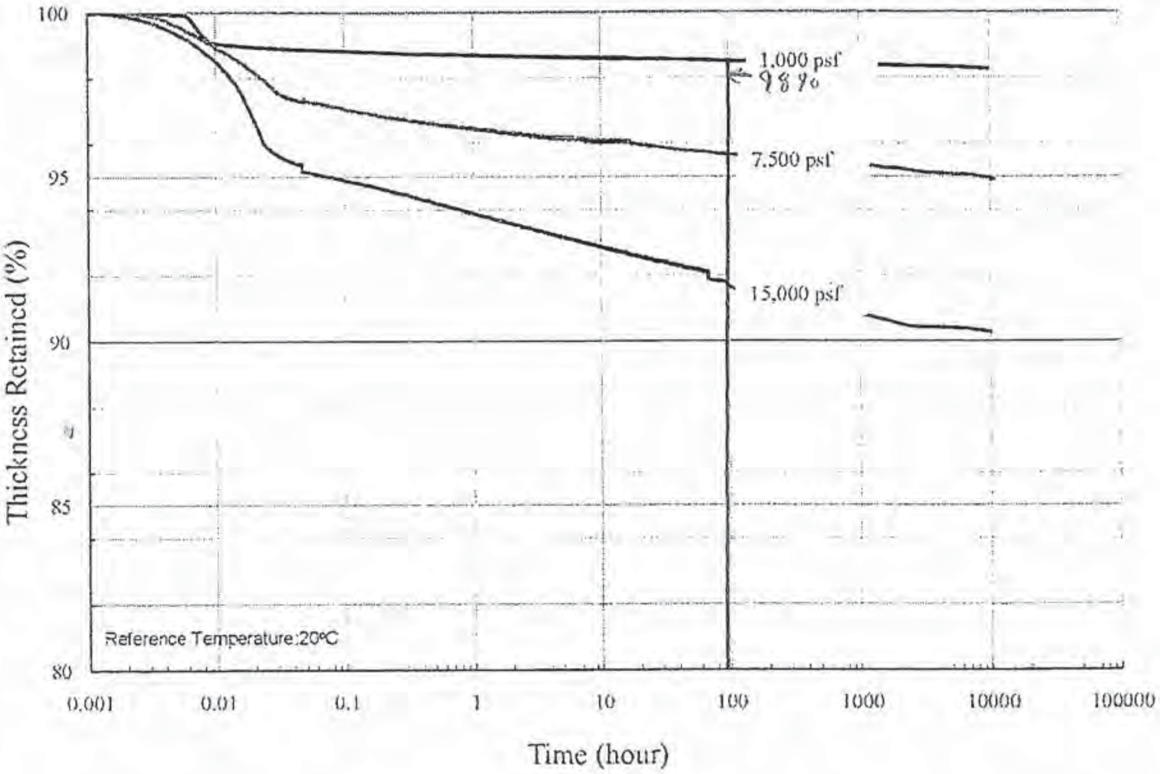
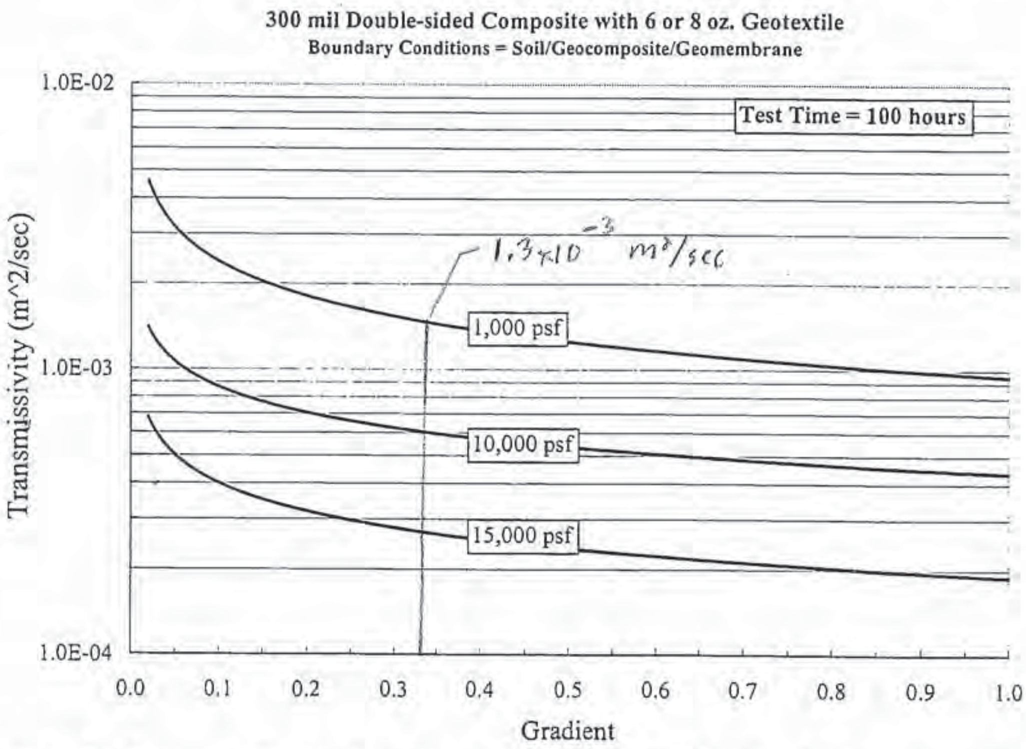


Figure B-3. Creep Curves for a 300 mil GSE HyperNet UF geonet.

Table B-3. Creep Reduction Factors for a 300 mil GSE HyperNet UF geonet from 100 hours to 50 Years.

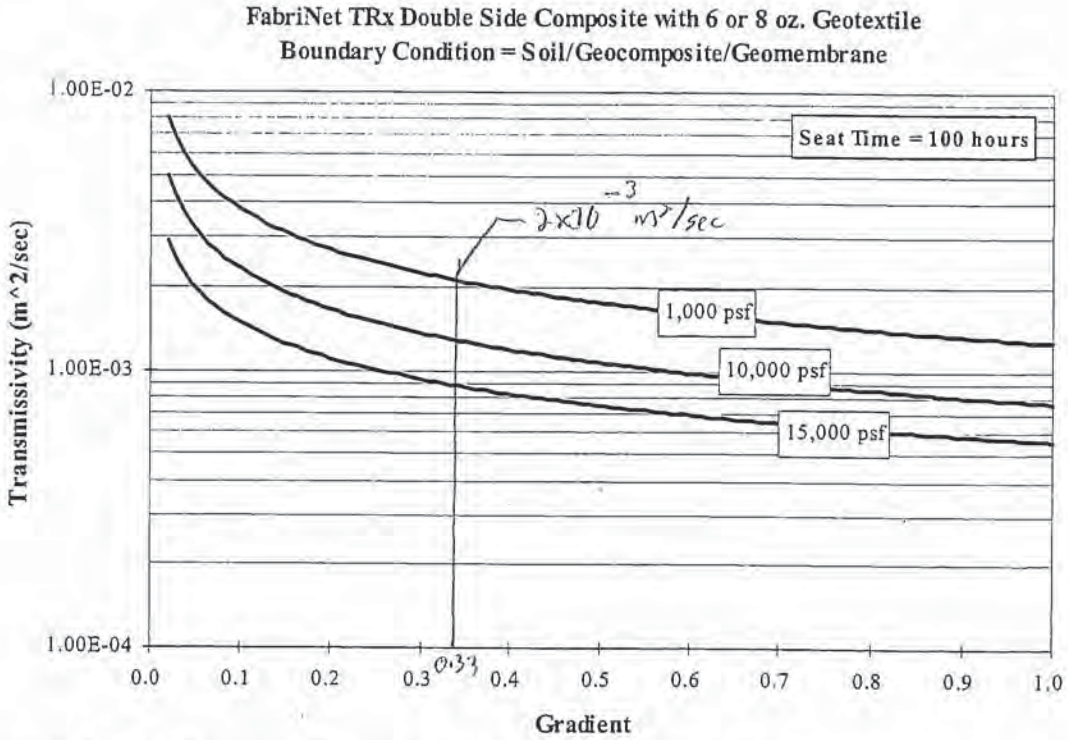
Stress (psf)	Creep Reduction Factor
1,000	1.00
5,000	1.06
15,000	1.19

ATTACHMENT B



1.3×10^{-3} m²/sec

Figure A-9. Performance Transmissivity of a 300 mil GSE FabriNet UF geocomposite under Soil.



2×10^{-3} m²/sec

0.33

Figure A-10. Performance Transmissivity of GSE FabriNet TRx geocomposite under Soil.

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Project: SPSA Cell VII		Computed: JMY	Date: 7/31/08
Subject: Part B Application		Checked:	Date:
Task: Geocomposite Capacity (LCS)		Page: 1	of: 1
Job #: 00018-02889-014		No:	

Short-Term / Low Stress Analysis

OBJECTIVE: Determine the short-term / low stress hydraulic conductivity of geocomposite to be used in Cell VII leachate collection system. Use this value in HELP Model analyses for open condition and when there is relatively little waste present within the cell.

ASSUMPTIONS: Based on results of Long-Term / High Stress geocomposite capacity analysis, assume geocomposite will be 300 mil GSE Permanet HL or equivalent.

PROCEDURE:

Determine transmissivity θ of 300 mil GSE PermaNet HL geocomposite:

Based on conversation w/ Mengjia Li w/ GSE, 100-hr transmissivity @ 1000 psf load $= 2 \times 10^{-3}\ m^2/sec. = 20\ cm^2/sec$

Determine hydraulic conductivity of 300 mil PermaNet HL:

$K = \frac{\theta}{b}$ where b = thickness of geocomposite

Since we are interested in short term conditions, use b = thickness before creep deforms material. $\therefore b = 0.300 in = \underline{0.76 cm}$

$$\therefore K = \frac{20\ cm^2/sec}{0.76 cm} = \underline{26.32\ cm/sec}$$

CONCLUSION:

For Short-term / low stress HELP Model analyses, use the following values for the leachate collection system geocomposite:

$b = 0.30$ in

$k = 26.32$ cm/sec

Project: SPSA Cell VII | Computed: JMY | Date: 7/30/08
Subject: Part B Application | Checked: | Date:
Task: Geocomposite Capacity (LCS) | Page: 1 | of: 2
Job #: 00018-02889-014 | No:

Long-Term / High Stress Analysis

OBJECTIVE: Determine the required transmissivity (θ_{req}) for the leachate collection layer in Cell VIII. Use $\theta_{req.}$ in HELP model analyses to determine suitability of design.

ASSUMPTIONS: Based on project specs., assume geocomposite has the following properties:

Thickness prior to loading = 0.250 in {Need to change to 0.300 in}

Avg. transmissivity = 6.5×10^{-4} m²/sec @ 100 hrs *

* based on normal compressive load of 10,000 psf, hydraulic gradient of 0.3, and boundary conditions of soil interface on upper geotextile and HDPE geomembrane on lower geotextile.

Use analyses as outlined in GRI-GC8 as summarized in GSE Drainage Design Manual, Second Edition

PROCEDURE:

Determine maximum normal compressive load acting on geocomposite within Cell VII (σ_v):

lowest elevation of geocomposite in areas of highest fill = −18 ft msl.

Max. closure el. in Cell VII ≈ 190 ft msl

Max. ht. of fill in Cell VII = 190 ft + 18 ft = 208 ft

Unit wt. of waste = 62.4 lb/ft³ (based on SPSA records)

$\therefore \sigma_v = 62.4 \text{ lb/ft}^3 (208 \text{ ft}) = \underline{12,979 \text{ lb/ft}^2}$

From GRI-GC8, $\theta_{allow} = \theta_{req} \cdot FS_D \cdot RF_{CR} \cdot RF_{CC} \cdot RF_{BC}$

where: θ_{allow} = Specified transmissivity of geocomposite (100 hr)
$= \underline{6.5 \times 10^{-4} \text{ m}^2/\text{sec}}$

θ_{req} = Required transmissivity of geocomposite after taking into account reduction factors. This value to be used in HELP model calcs. and other calcs (m²/sec)

FS_D = Overall factor of safety for drainage = <u>2.0</u> based on GSE manual recommendations.

RF_{CR} = reduction factor for long-term creep

Based on required transmissivity of 6.5×10^{-4} m²/sec (100 hr @ 10,000 psf), a high performance product such as GSE PermaNet HL will be required, which has a net thickness of ≈ 300 mil. Therefore use creep data for PermaNet HL tested with soil on top side and geomembrane on lower side. Att. A shows that this product meets the minimum transmissivity requirement. Att. B shows that RF_{CR} = <u>1.12</u> for this product @ σ_v = 15,000 psf.

RF_{CC} = reduction factor for chemical clogging = <u>1.5</u> as recommended in GSE Manual.

RF_{BC} = reduction factor for biological clogging = <u>1.3</u> as recommended in GSE Manual.

Determine θ_{req}:

$$\theta_{req} = \frac{\theta_{allow}}{FS_D \cdot RF_{CR} \cdot RF_{CC} \cdot RF_{BC}} = \frac{6.5\times10^{-4}\ \text{m}^2/\text{sec}}{2.0(1.12)(1.5)(1.3)} = \boxed{1.5\times10^{-4}\ \text{m}^2/\text{sec}}$$

Determine reduction in the thickness of the geocomposite due to creep:

From Att. B, approx. 90% of thickness of PermaNet HL is retained after 100 hrs.

$$\therefore \text{ use thickness of geocomposite} = 0.9\ (300\ \text{mil}) = \boxed{270\ \text{mil}} = b$$
$$= 0.69\ \text{cm} = 0.0069\ \text{m}$$

Calculate effective saturated hydraulic conductivity of geocomposite:

$$k = \frac{\theta_{reqd}}{b} = \frac{1.5\times10^{-4}\ \text{m}^2/\text{sec}}{0.0069\ \text{m}} = 0.0217\ \text{m/sec} = \boxed{2.17\ \text{cm/sec}}$$

CONCLUSION: For HELP model, use k = 2.17 cm/sec and thickness = 0.27 in for geocomposite for long-term / high stress analyses.

ATTACHMENT A

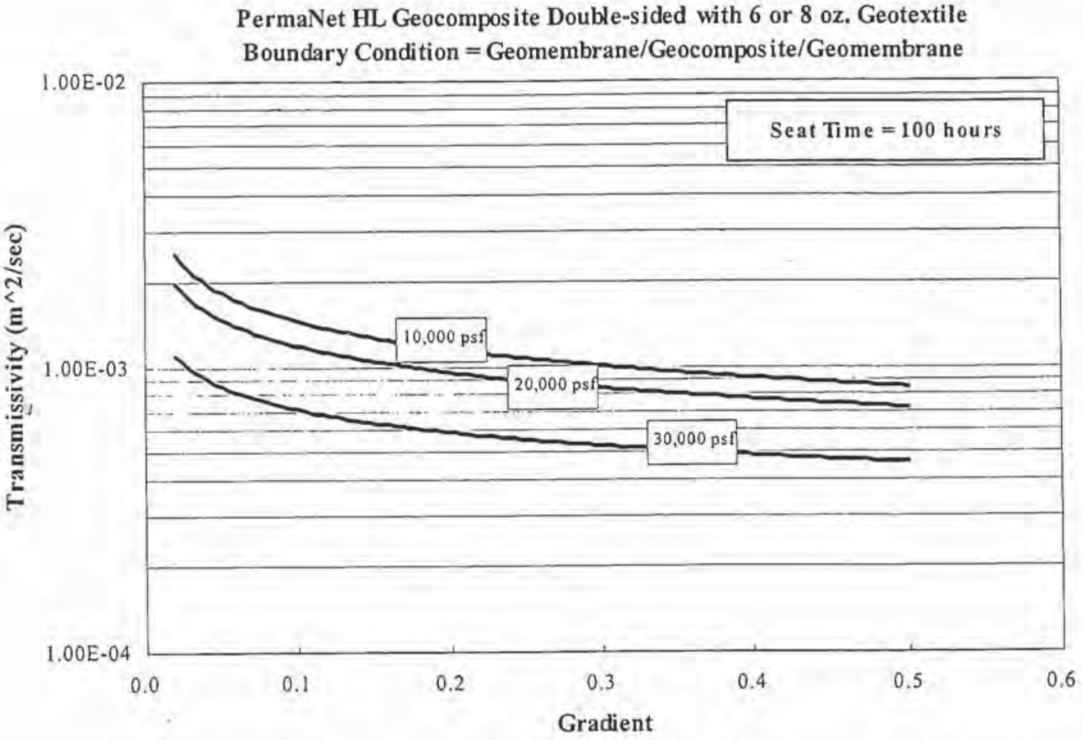
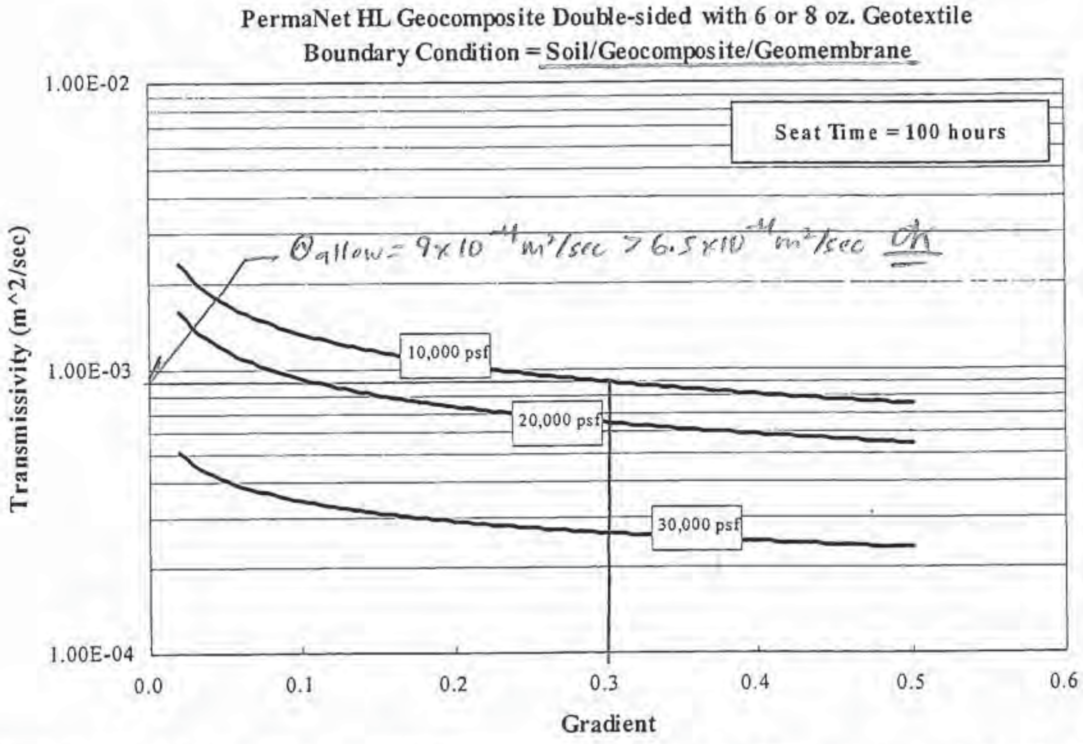


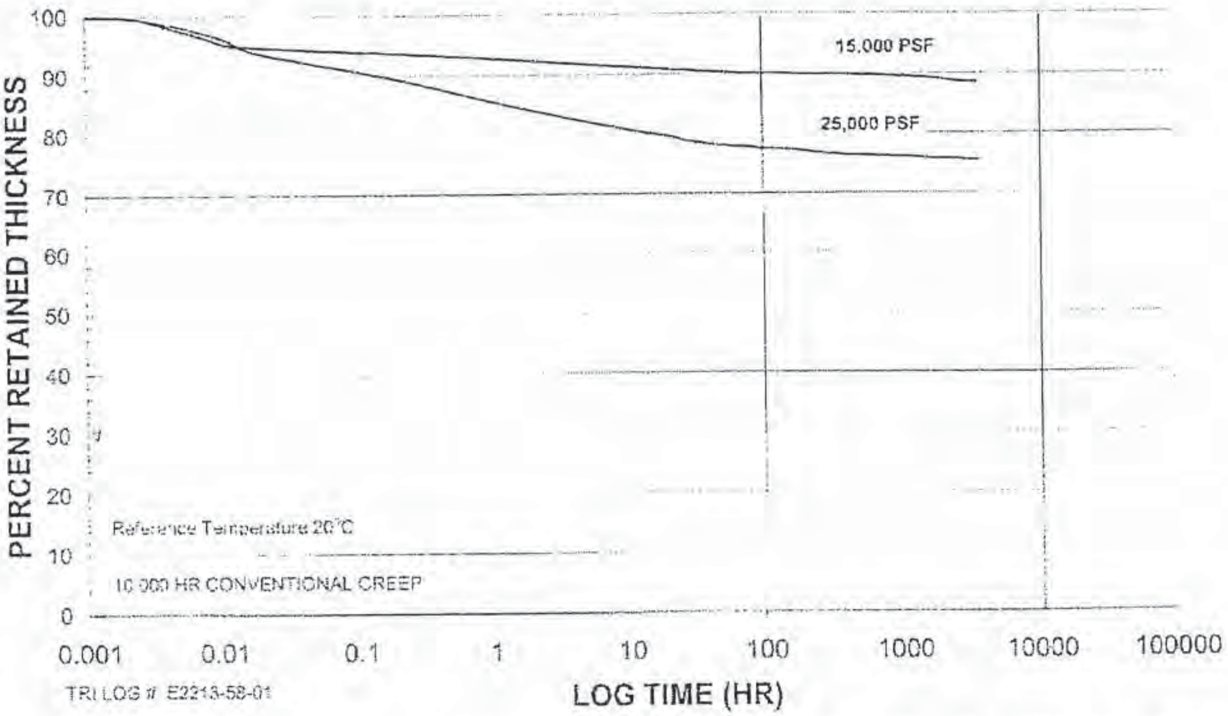
Figure A-13. Performance Transmissivity of GSE PermaNet HL geocomposite between Plates.



$\theta_{allow} = 9 \times 10^{-4}\ m^2/sec > 6.5 \times 10^{-4}\ m^2/sec$ OK

Figure A-14. Performance Transmissivity of GSE PermaNet HL geocomposite under Soil.

ATTACHMENT B



TRI LOG # E2213-58-01

Figure B-5. Creep Curves for GSE PermaNet HL geonet at 15,000 psf and 25,000 psf.

Table B-5. Creep Reduction Factors for GSE PermaNet HL geonet from 100 hours to 50 Years.

Stress (psf)	Creep Reduction Factor
15,000	1.12 use for Cell VIII
25,000	1.16

LEACHATE and GROUNDWATER PIPING

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Project SPSA Regional Landfill		**Computed** GMW	**Date**
Subject Leachate Collection System		**Checked** JMP	**Date** 8/26/08
Task Leachate Pipe Sizing		**Sheet**	**Of**

Objective:

Prepare a calculation demonstrating that the most critical leachate pipe (i.e. carrying the most flow) will have enough post-settlement slope to carry the maximum anticipated leachate flow

Procedure:

1) Calculate max leachate flow into longest pipe into Sump No. 11 using max daily flow from HELP model (convert to cfs or gpm). See attached C-03 markup.

Drainage Collected= 4,137 cu.ft / acre / day
Drainage Area = 7.23 acres
Total Drainage = 29,911 cu. ft. / day
or 0.35 cu ft. / sec

2) Calculate post settlement slope on this leachate line using Ted's settlement numbers. Assume leachate line is linear between the two ends (i.e. only need to calculate post settlement line elevations on the ends of the pipe).

Pre-Settlement Slope Calculation

Pipe Length =	860 ft	from Sheet C-03
Upstream Invert =	-12.0 ft	from Sheet C-03
Downstream Invert=	-18.0 ft	from Sheet C-03
Slope =	0.70%	

Post-Settlement Slope Calculation

Pipe Length =	860 ft	from Sheet C-03
Upstream Invert =	-16.9 ft	from Sheet C-03 minus calculated settlement value
Downstream Invert=	-21.6 ft	from Sheet C-03 minus calculated settlement value
Slope =	0.54%	

3) Calculate capacity of the 8" leachate collection line using the post-settlement slope.

Manning's Equation Q=1.49/n*A*R^(2/3)*S^(1/2)

where n=manning's coefficient
Q=discharge (cfs)
A=Cross sectional area (ft^2)
R=hydraulic radius (ft)
S=slope (ft/ft)

Assuming pipe is full:
A= 0.35 ft^2
R= 0.17 ft
S= 0.05 ft/ft
n= 0.01 for HDPE

Solve for Q = 3.52 cfs

The capacity of an 8" diameter HDPE pipe is 3.52 cfs which is greater than the anticipated leachate flow.

4) Calculate leachate flow into pipes from perforations. See Sheet C-15 for detail.

Orifice Equation $Q = C_d * A * (2 * g * h)^{0.5}$

where Q = cfs, discharge
C_d = 0.6
A = sf, cross sectional area
g = 32.2
h = ft, driving head

Assmuming regulated 12" head on liner, calculate flow through bottom two (2) 1/4" holes spaced @ 4" on center

h= 1 ft
A= 0.0003 ft^2

Solve for Q = 0.002 cfs per 4" of pipe (hole spacing)
or 0.47 cfs for the entire pipe

The capacity of 1/4" diameter preforations in bottom of 8" HDPE pipe is 0.47 cfs which is greater than the anticipated leachate flow.

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Project:	SPSA Cell VII	Computed:	TMY	Date:	8/28/08
Subject:	Part B Application	Checked:	DTD	Date:	8/29/08
Task:	Groundwater Pipe Capacity	Page:	1	of:	3
Job #:	00016-02889-014	No:			

OBJECTIVE: Confirm that 6" ø groundwater extraction pipe is adequately sized for anticipated groundwater flows.

ASSUMPTIONS:

① Typical horizontal permeability of undisturbed soils in Cell VII ≈ 3.72×10^{-5} cm/sec based on slug tests (ref. Part A Application).

② No vertical upward component of groundwater flow in Cell VII based on Part A Application.

③ Based on Part A Application, hydraulic gradient (i) in Cell VII area ranges between 0.001 → 0.007. Use $i = 0.007$ for worst-case analysis.

PROCEDURE:

Determine GW pipe that will carry most seepage:
From Basegrade Plan (Att. A), determine section of GW header pipe at base of slope that will transmit the largest amount of seepage. Seepage into the bottom of Cell VII should be minimal since the vertical seepage gradient is downward (Ref. Cell VII Part A Application).

From Att. A, most critical GW pipe is located on the south side of Cell VII and drains to sump No. 13. It will transmit seepage from approx. 820 LF of sideslope.

Determine flow quantity into critical pipe:
GW flow into Cell VII is horizontal. Assume 40' of saturated thickness on sideslope.

$Q = kia$ where:

Q = flow into pipe (CFS)

K = horizontal permeability of undisturbed soils

$= 3.72\times10^{-5}$ cm/sec $= 1.22\times10^{-6}$ ft/sec

i = horizontal hydraulic gradient = 0.007

a = flow area contributing to pipe flow measured perpendicular to surface

$= 40'(820') = 32{,}800\ \text{ft}^2$

$\therefore\ Q = 1.22\times10^{-6}\ \text{ft/sec}\,(0.007)(32{,}800\ \text{ft}^2) = \underline{2.8\times10^{-4}\ \text{ft}^3/\text{s}}$

Determine flow capacity of pipe (6" SDR 11 HDPE):

Use Manning Eqn.: $Q = (1.49/n)(A)R^{2/3}S^{1/2}$ (Assume flowing full)

where: Q = discharge (CFS)

n = friction coeff. = 0.01 for HDPE

A = flow area (flowing full)

inside diameter 6" SDR 11 = 5.35 in

$\therefore A = \frac{\pi(5.35)^2}{4} = 22.5\ \text{in}^2 = 0.16\ \text{ft}^2$

R = hydraulic radius = $\frac{A}{\text{wetted perimeter}}$

$WP = 2\pi\left(\frac{5.35}{2(12)}\right) = 1.40\ \text{ft}$ (flowing full)

$\therefore R = \frac{0.16\ \text{ft}^2}{1.40\ \text{ft}} = 0.11\ \text{ft}$

S = slope = 0.0067

$\therefore\ Q_f = \left(\frac{1.49}{0.01}\right)(0.16)(0.11)^{2/3}(0.0067)^{1/2} = \underline{0.45\ \text{ft}^3/\text{s}}$

Since $Q_f \gg Q$ $\underline{\underline{\text{OK}}}$

Verify capacity of pipe perforations:

Perforations = 2 rows of 1/4" holes spaced 4" on center

Assume 6" head over perforations, $h = 0.5$ ft

Use Orifice eqn. to determine flow per perforation:

$$Q = C_d (A)(2gh)^{0.5}$$

where: Q = discharge (CFS)
C_d = discharge coeff. = 0.6
A = cross-sectional area of perf.
$= \frac{\pi (0.25)^2}{4} = 0.049 \text{ in}^2 = 0.0003 \text{ ft}^2$
g = acceleration due to gravity = 32.2 ft ft/s^2

$$\therefore Q = 0.6(0.0003)(2(32.2)(0.5))^{0.5} = 0.001 \text{ ft}^3/\text{s per perf.}$$

No. of perforations along critical pipe:

No. perfs = 820 ft (6 perf./ft) = 4,920 perfs.

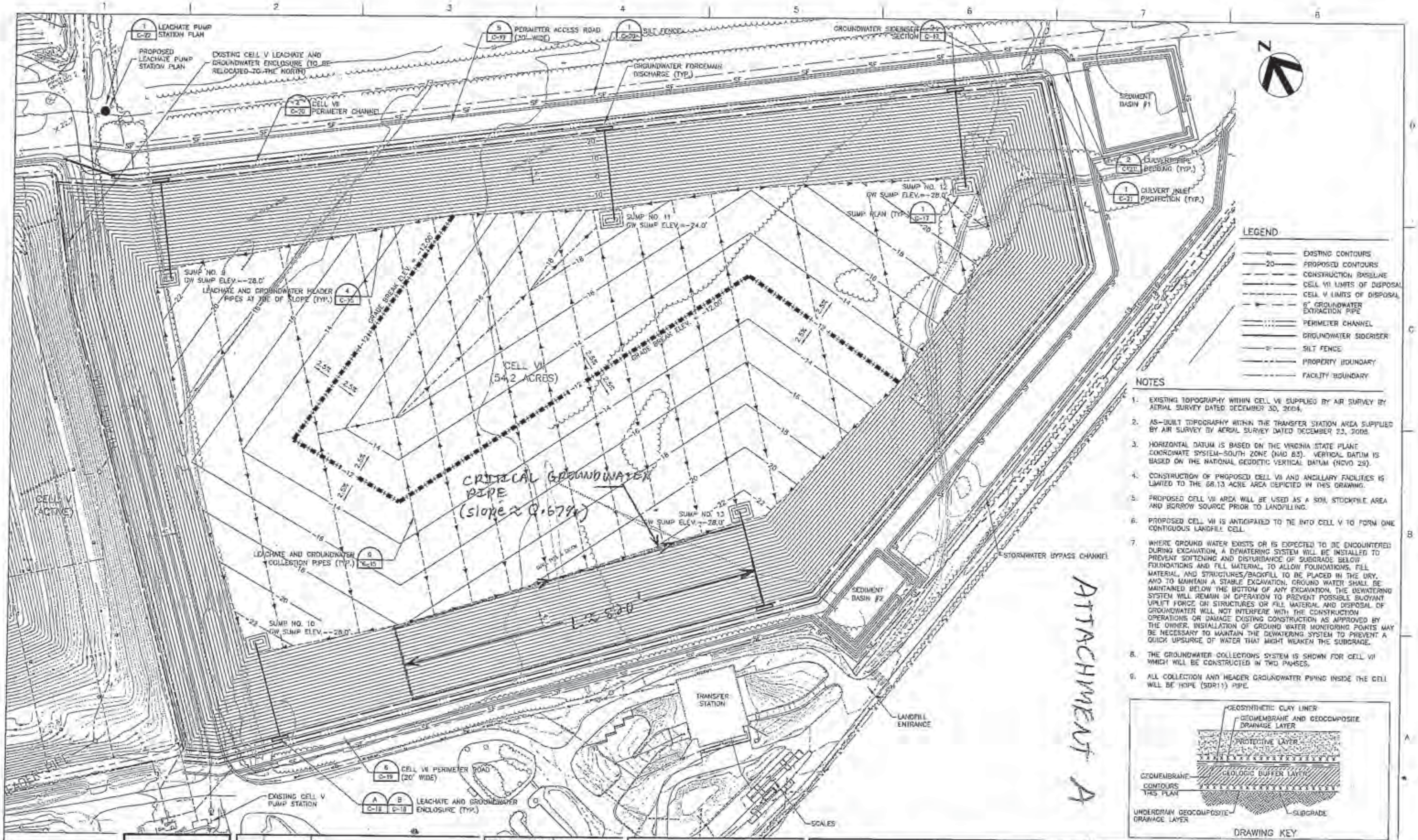
Capacity of perfs:

4,920 perfs (0.001 ft^3/s per perf) = 4.92 CFS

Since 4.92 cfs $> 2.8 \times 10^{-4}$ ft^3/s <u>ok</u>

CONCLUSION:

Proposed groundwater collection pipe design has adequate capacity.



ATTACHMENT A

NOTES

1. EXISTING TOPOGRAPHY WITHIN CELL VII SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 30, 2004.
2. AS-BUILT TOPOGRAPHY WITHIN THE TRANSFER STATION AREA SUPPLIED BY AIR SURVEY BY AERIAL SURVEY DATED DECEMBER 23, 2008.
3. HORIZONTAL DATUM IS BASED ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM–SOUTH ZONE (NAD 83). VERTICAL DATUM IS BASED ON THE NATIONAL GEODETIC VERTICAL DATUM (NGVD 29).
4. CONSTRUCTION OF PROPOSED CELL VII AND ANCILLARY FACILITIES IS LIMITED TO THE 68.13 ACRE AREA DEPICTED IN THIS DRAWING.
5. PROPOSED CELL VII AREA WILL BE USED AS A SOIL STOCKPILE AREA AND BORROW SOURCE PRIOR TO LANDFILLING.
6. PROPOSED CELL VII IS ANTICIPATED TO TIE INTO CELL V TO FORM ONE CONTIGUOUS LANDFILL CELL.
7. WHERE GROUND WATER EXISTS OR IS EXPECTED TO BE ENCOUNTERED DURING EXCAVATION, A DEWATERING SYSTEM WILL BE INSTALLED TO PREVENT SOFTENING AND DISTURBANCE OF SUBGRADE BELOW FOUNDATIONS AND FILL MATERIAL, TO ALLOW FOUNDATIONS, FILL MATERIAL, AND STRUCTURES/BACKFILL TO BE PLACED IN THE DRY, AND TO MAINTAIN A STABLE EXCAVATION. GROUND WATER SHALL BE MAINTAINED BELOW THE BOTTOM OF ANY EXCAVATION. THE DEWATERING SYSTEM WILL REMAIN IN OPERATION TO PREVENT POSSIBLE BUOYANT UPLIFT FORCE ON STRUCTURES OR FILL MATERIAL AND DISPOSAL OF GROUNDWATER WILL NOT INTERFERE WITH THE CONSTRUCTION OPERATIONS OR DAMAGE EXISTING CONSTRUCTION AS APPROVED BY THE OWNER. INSTALLATION OF GROUND WATER MONITORING POINTS MAY BE NECESSARY TO MAINTAIN THE DEWATERING SYSTEM TO PREVENT A QUICK UPSURGE OF WATER THAT MIGHT WEAKEN THE SUBGRADE.
8. THE GROUNDWATER COLLECTIONS SYSTEM IS SHOWN FOR CELL VII WHICH WILL BE CONSTRUCTED IN TWO PAHSES.
9. ALL COLLECTION AND HEADER GROUNDWATER PIPING INSIDE THE CELL WILL BE HDPE (SDR11) PIPE.

HDR

HDR Engineering, Inc. of the Carolinas

3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002889.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

BASEGRADE PLAN

0 1" 2"

FILENAME 00C-02.dwg

SCALE 1"=100'

SHEET C-02

C:\pwworking\tpa\d\ms9350700C-02.dwg, Plot, 8/26/2008 11:26:32 AM, jpatters

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LEACHATE TANK CAPACITY

HDR Computation

Job Number	2889			No.	
Project	Southeastern Public Service Authority	Computed	SPF	Date	2/4/2009
Subject	Cell VII Expansion	Checked	TMY	Date	2/12/2009
Task	Leachate Storage Volume	Sheet	1	Of	1

Objective: Determine volume of leachate generated across the site in order to design a storage tank

References:
1. HELP v3.07 Model
2. Part B Plan Set Sheet C-01
3. Cell VII Expansion Design Report

Calculations:

	HELP Model Condition	Waste Area (Acres)	Peak Daily Drainage (gal/ac/day)	Average Annual Drainage (gal/ac/yr)	Peak Daily Drainage (gal)	Average Daily Drainage (gal)	% Average Daily to Peak Daily
Cells I-IV	Closed	103	0	1	6	0.28	5%
Cell V	Partial Closure	43.6	4,475	329,232	195,110	39,301	20%
Cell VI	Partial Closure	41	4,475	329,232	183,475	36,957	20%
Cell VII Phase 1	20' Waste w/ 100% Recirculation	31	30,947	3,218,527	953,168	271,405	28%
Cell VII Phase 2	Open	25	110,831	450,284	2,804,024	31,190	1%

Historical leachate discharge quantities for the site are as follows (Mar '99 thru Jun '08):

Maximum Daily Leachate Flow = 1,171 gal/ac/day
Minimum Daily Leachate Flow = 53 gal/ac/day
Average Daily Leachate Flow = 224 gal/ac/day

VA DEQ regulation state that 7 days of leachate should be able to be stored on site.

Assume 6 days at historical maximum flow and 1 day using HELP Model Average Daily:

Total volume to be stored = 2,091,089 gal
Existing Leachate Lagoon Storage Capacity = 1,600,000 gal
Additional Capacity required for Cell VII = 491,089 gal

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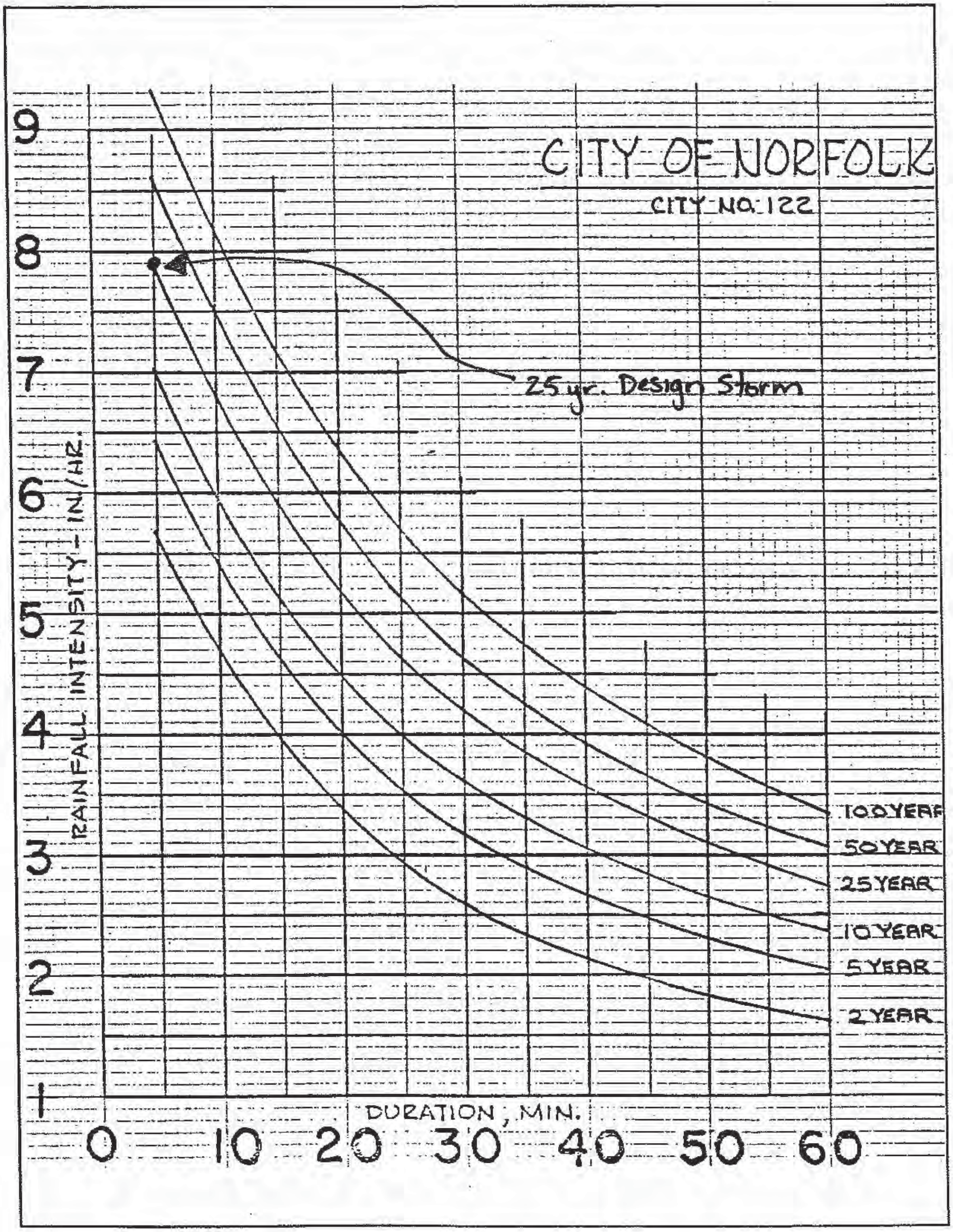
STORMWATER



Source: VDOT

Plate 5-5

1992

TABLE 5-2
VALUES OF RUNOFF COEFFICIENT (C) FOR RATIONAL FORMULA

Land Use	C	Land Use	C
Business:		Lawns:	
Downtown areas	0.70-0.95	Sandy soil, flat, 2%	0.05-0.10
Neighborhood areas	0.50-0.70	Sandy soil, average, 2-7%	0.10-0.15
		Sandy soil, steep, 7%	0.15-0.20
		Heavy soil, flat, 2%	0.13-0.17
		Heavy soil, average, 2-7%	0.18-0.22
		Heavy soil, steep, 7%	0.25-0.35
Residential:		Agricultural land:	
Single-family areas	0.30-0.50	Bare packed soil	
Multi units, detached	0.40-0.60	* Smooth	0.30-0.60
Multi units, attached	0.60-0.75	* Rough	0.20-0.50
Suburban	0.25-0.40	Cultivated rows	
		* Heavy soil, no crop	0.30-0.60
		* Heavy soil, with crop	0.20-0.50
		* Sandy soil, no crop	0.20-0.40
		* Sandy soil, with crop	0.10-0.25
		Pasture	
		* Heavy soil	0.15-0.45
		* Sandy soil	0.05-0.25
		Woodlands	0.05-0.25
Industrial:		Streets:	
Light areas	0.50-0.80	Asphaltic	0.70-0.95
Heavy areas	0.60-0.90	Concrete	0.80-0.95
		Brick	0.70-0.85
Parks, cemeteries	0.10-0.25	Unimproved areas	0.10-0.30
Playgrounds	0.20-0.35	Drives and walks	0.75-0.85
Railroad yard areas	0.20-0.40	Roofs	0.75-0.95

Note: The designer must use judgement to select the appropriate "C" value within the range. Generally, larger areas with permeable soils, flat slopes and dense vegetation should have the lowest C values. Smaller areas with dense soils, moderate to steep slopes, and sparse vegetation should be assigned the highest C values.

Source: American Society of Civil Engineers

Project: SPSA Cell VII	Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage	Checked PAW	Date 2-12-09
Task: Sideslope Channels	Sheet 1	Of 2

References

1. Elements of Urban Stormwater Design, H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook

Objective Design and size perimeter ditches to handle flow from a 25 year storm event.

Equations

Normal Depth Procedure (Manning's Eqn)

$AR^{2/3}=Qn/1.49s^{0.5}$ Area $(A)= bd+z(d^2)$ $Z_{av}=AR^{2/3}$

$Z_{req}=Qn/1.49s^{0.5}$ $R=Area/(b+2d((z^2+1)^{0.5})$ Avg Shear Stress(T) = d*s*unit weight of water

Design Channels along the access road

Min Channel Freeboard = 0.5 ft

Inside Channel Side Slope = 3 (enter X for X:1)

Outside Channel Side Slope = 2 (enter X for X:1)

Bottom Width, b = 0 ft

Q (cfs) = CIA = Peak Flow

Runoff Coefficient, C = 0.3 Ag Land, Bare Packed Soil, Rough (0.20 - 0.50) Ref 2, Table 5-2, p V-29

Design Storm: 25-Yr, 5-min

I (in/hr) = 7.9 Ref 2, Plate 5-5, Norfolk, p V-15

A (Ac) = 1.72 based on max drainage area off the LF waste pile (North East side of Cell 7, Fig 1)

Calculated Flow Rate Q (cfs) = 4.08

Various Lining Types

Lining Type	Lining Description	Manning's n depths of 0.5-2.0 ft	Vp (ft/sec)	Allowable Shear Stress psf
A	Jute Net (HEC-15)	0.015	2.0	0.45
B	Erosion Control Blanket Single Net (Curlex 1)	0.034	5.0	1.55
C	Erosion Control Blanket Double Net (Curlex HV)	0.026	10.0	1.65
D	Ordinary Firm Loam (Ref 2)	0.020	3.5	2.0
E	Grass Lined (Ref 2)	0.030	5.0	2.0
F	6" Rip Rap (Ref 2, Ref 1)	0.069	9.0	2.0
G	Unvegetated Turf Reinforcement Mat (TRM) (NAG C350)	0.025	9.5	2.25
H	Class D Phase 2 (Partially vegetated) TRM (NAG C350)	0.048	14.0	3.34
I	12" Rip Rap (Ref 2, Ref 1)	0.078	12.5	4.0
J	Class B Phase 3 (Fully vegetated) TRM (NAG C350)	0.048	18.0	5.7
K	Concrete (HEC-15, EPA 832-F-99-002)	0.013	25.0	10.0

Project: SPSA Cell VII	Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage	Checked PAW	Date 2-12-09
Task: Sideslope Channels	Sheet 2	Of 2

Select Lining System for each channel slope that will handle the design flow when vegetated and when initially constructed.

Assume the channel slope is constructed at 3% but settles to 1%

Lining Type	Channel Slope	Z_{req}	Flow Depth d (ft)	Cross Sectional Area (sf)	R	Z_{avail}	Velocity (ft/sec)	Average Shear Stress (lb/sf)	
Permanent Lining									
E	3.0%	0.47	0.6	1.05	0.30	0.47	3.9	1.2	
E	1.0%	0.82	0.8	1.59	0.37	0.82	2.6	0.5	
Initial Lining									
D	3.0%	0.32	0.6	0.79	0.26	0.32	5.2	1.0	Need Temp Lining
D	1.0%	0.55	0.7	1.18	0.32	0.55	3.5	0.4	
Temporary Lining									
B	3.0%	0.54	0.7	1.16	0.32	0.54	3.5	1.3	
B	1.0%	0.93	0.8	1.75	0.39	0.93	2.3	0.5	

CONCLUSION

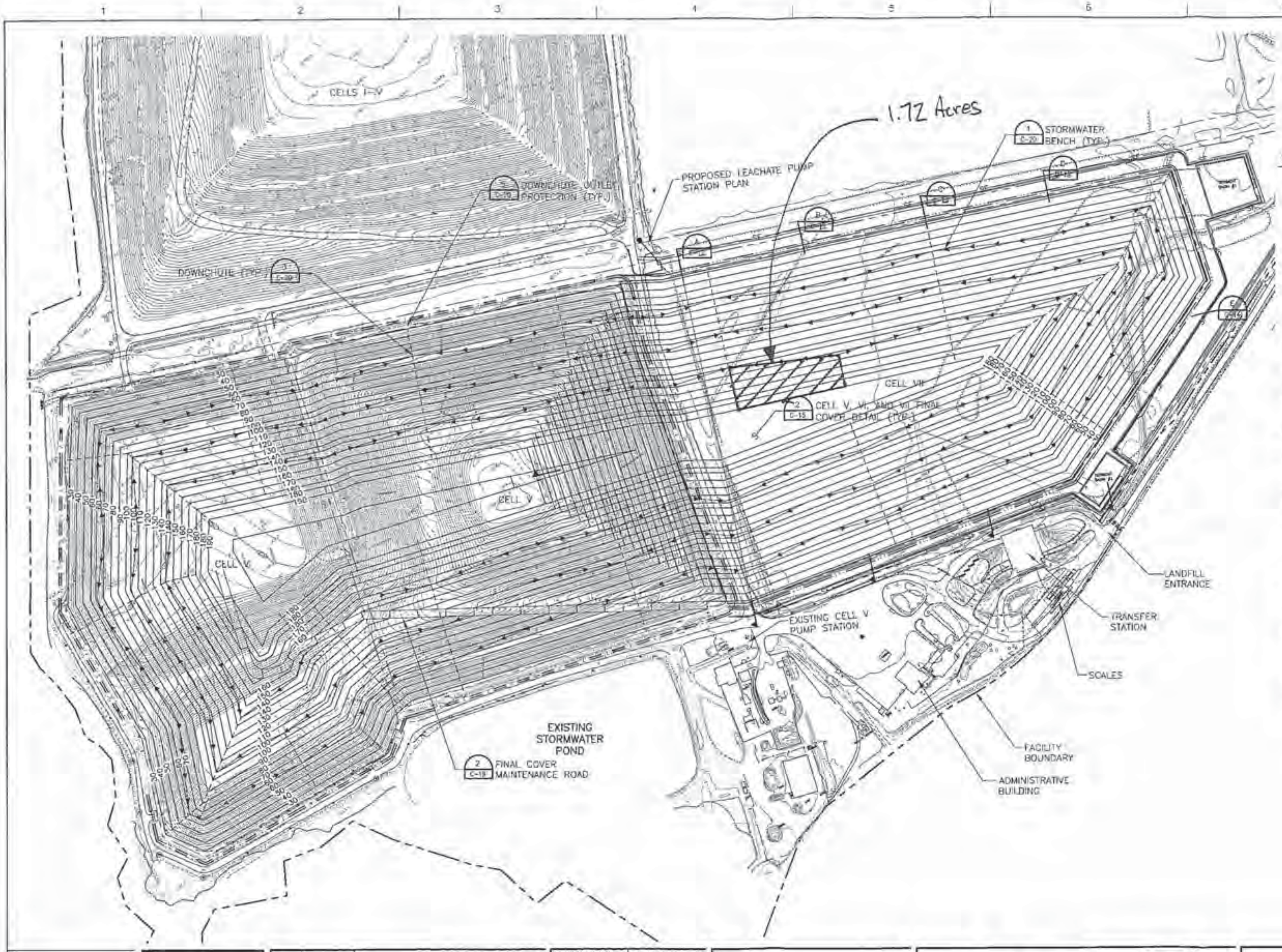
1. The above calculations are for the "Worst Case Scenario" or largest drainage area of a sideslope channel for Cells V, VI andVII

   Drainage area= **1.72 ac**
   Bottom Width (ft) = **0**
   Depth (ft) = **1.3**
   Channel Slope = 3.0%
   Side Slope= 3H:1V Inside and 2H:1V Outside

2. The sideslope channel design approved for Cells V, VI, and VII are as follows:

   Bottom Width (ft) = **0**
   Side Slopes = 3H:1V Inside and 2H:1V Outside
   Depth = **2**

3. Permanent lining shall be grass and the temporary lining shall be Curlex I.



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11. FINAL COVER GRADES DEPICT TOP OF FINAL COVER.
12. STORMWATER BENCHES ARE SHOWN SCHEMATICALLY. ARROWS SHOW DIRECTION OF FLOW.

LEGEND

—0—	EXISTING CONTOURS
—20—	FINAL COVER GRADES
— - —	CONSTRUCTION BASELINE
— - - —	FACILITY BOUNDARY
— - —	SILT FENCE
→→→	SIDESLOPE BENCH
— — —	DOWNCHUTE
— - - —	PROPERTY BOUNDARY
═══	PERIMETER CHANNEL

HDR

HDR Engineering, Inc. of the Carolinas

3733 National Drive, Suite 207 | Raleigh, NC 27612

ISSUE	DATE	DESCRIPTION
B	01/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002689.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C–09.dwg
SCALE	1"=200'

SHEET FIG 1

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Project:	SPSA Cell VII	Computed:	GMW	Date:	2/11/09
Subject:	Storm Water Drainage	Checked	PAW	Date	2-12-09
Task:	Reno Mattress Lined Downchute	Sheet	1	Of	2

Objective

Size a Reno Mattress downchute based on sideslope swale inlet flow rates

Constraints

Minimize the cross sectional area since this will be incorporated into the cover system

References:

1. Elements of Urban Stormwater Design, H. Rooney Malcom, P.E.
2. VA Erosion and Sediment Control Handbook
3. Macaferri, Inc.

Drainage Area

Calculate Peak Flow

Q (cfs) = CIA = Peak Flow

Drainage Area, A (acres) = to be determined

Runoff Coefficient, C =	0.3	Ag Land,Bare Packed Soil, Rough (0.20 - 0.50)	Ref 2, Table 5-2, p V-29
Intensity, I (in/hr) =	7.9	25-year, 5-min Design Storm	Ref 2, Plate 5-5, Norfolk, p V-15

Equations:

Normal Depth Procedure (Ref 1)

$AR^{2/3}=Qn/1.49s^{0.5}$ Area (A)= bd+z(d^2) $Z_{av}=AR^{2/3}$

$Z_{req}=Qn/1.49s^{0.5}$ R=Area/(b+2d((z^2)+1)^.5) Q=CIA

Assumptions

The drainage area may vary for each downchute, therefore determine the max drainage area that may be routed through the downchute.

Max (ac) =	8.94	See attached drawing (Figure 2)
Flow Rate Q (cfs) =	21.2	flow at bottom of downchute (max drainage area)

Project: SPSA Cell VII		Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage		Checked PAW	Date 2-12-09
Task: Reno Mattress Lined Downchute		Sheet 2	Of 2

Prefer Reno Mattress

Manning's n = 0.07 Reno Mattress Lined, 6" (Ref 3)
max permissible velocity (ft/sec) = 13.8 for 6" (Ref 3)

Desired Freeboard = 0.5 ft
Design Channel Slope (s) = 3 X:1
Design Channel Slope (s) = 0.33 feet fall / foot run
Channel Side Slope (z) = 3 X:1
Bottom Width (b) = 8 ft

Flow Depth d (ft)	Cross Sectional A (sf)	Z_{req}	R	Z_{avail}	V (ft/sec)	Comment
0.39	3.54	1.72	0.34	1.72	6.0	OK

Check effects of settlement (flatter slope) on flow depth

Assume the landfill settles to approximately a 3.5:1 slope.

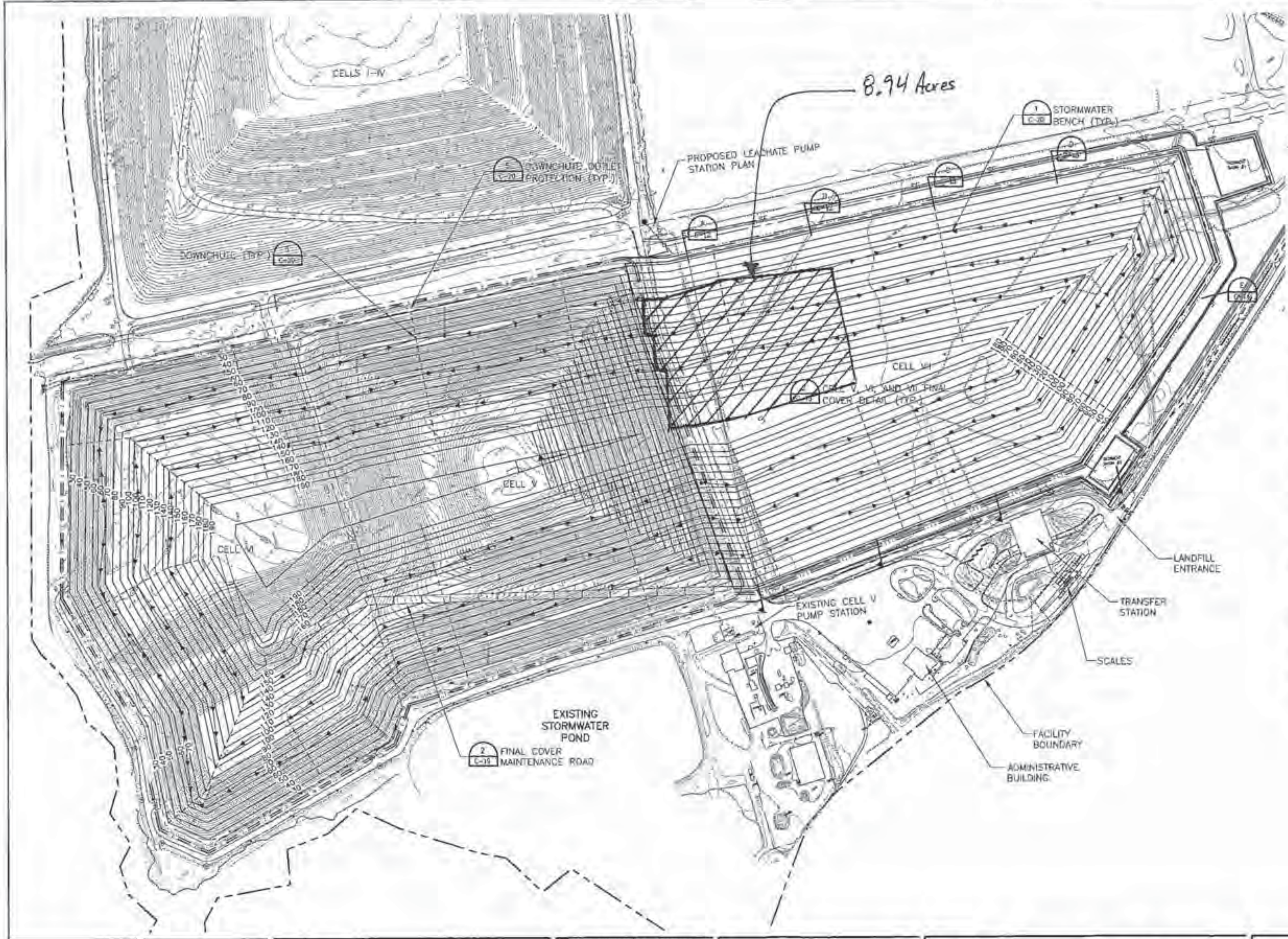
Channel Slope After Settlement (s) = 3.5 X:1
Channel Slope After Settlement (s) = 0.286 ft fall / foot run
Channel Side Slope (z) = 3 X:1
Bottom Width (b) = 8 ft

Flow Depth d (ft)	Cross Sectional A (sf)	Z_{req}	R	Z_{avail}	V (ft/sec)	Comment
0.53	3.83	1.86	0.34	1.86	5.5	OK

Conclusion:

Construct a trapezoidal shaped channel with the following dimensions:

Min Depth of downchute (ft) = 1.03 (includes freeboard)
Set Depth of downchute (ft) = 1.50
Outside Channel Side Slope (X:1) = 3
Inside Channel Side Slope (X:1) = 3
Design Channel Slope (X:1) = 3
Bottom Width (ft) = 8
Permanent Lining type = Reno Mattress w/6" diameter rip rap



N

D

C

B

A

NOTES

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LEGEND

——40——	EXISTING CONTOURS
——20——	FINAL COVER GRADES
——·–·——	CONSTRUCTION BASELINE
——-·-——	FACILITY BOUNDARY
—+—+—	SILT FENCE
—▶—▶—▶	SIDESLOPE BENCH
– — – —	DOWNCHUTE
——-·-——	PROPERTY BOUNDARY
═══	PERIMETER CHANNEL

HDR

HDR Engineering, Inc.
of the Carolinas

[illegible]

B	01/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002885.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C–09.dwg
SCALE	1"=200'

SHEET
FIG 2

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HDR Computation

Job No. 1743-2889-018

Project: SPSA Cell VII	Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage	Checked PAW	Date 2-12-09
Task: Perimeter Channels	Sheet 1	Of 2

References

1. Elements of Urban Stormwater Design, H. Rooney Malcom, P.E.
2. Virginia Erosion and Sediment Control Handbook

Objective Design and size perimeter ditches to handle flow from a 25 year storm event.

Equations

Normal Depth Procedure (Manning's Eqn)

$AR^{2/3}=Qn/1.49s^{0.5}$ Area $(A)=bd+z(d^2)$ $Z_{av}=AR^{2/3}$

$Z_{req}=Qn/1.49s^{0.5}$ $R=Area/(b+2d((z^2+1)^{0.5})$ Avg Shear Stress(T) = d*s*unit weight of water

Design Channels along the access road

Min Channel Freeboard = 0.5 ft
Inside Channel Side Slope = 2 (enter X for X:1)
Outside Channel Side Slope = 2 (enter X for X:1)
Bottom Width, b = 8 ft

Q (cfs) = CIA = Peak Flow
Runoff Coefficient, C = 0.3 Ag Land, Bare Packed Soil, Rough (0.20 - 0.50) Ref 2, Table 5-2, p V-29

Design Storm: 25-Yr, 5-min
I (in/hr) = 7.9 Ref 2, Plate 5-5, Norfolk, p V-15
A (Ac) = 46.1 based on max drainage area off the LF waste pile (North East side of Cell 7, Figure 3)
Calculated Flow Rate Q (cfs) = 109.1

Various Lining Types

Lining Type	Lining Description	Manning's n depths of 0.5-2.0 ft	Vp (ft/sec)	Allowable Shear Stress psf
A	Jute Net (HEC-15)	0.015	2.0	0.45
B	Erosion Control Blanket Single Net (Curlex 1)	0.034	5.0	1.55
C	Erosion Control Blanket Double Net (Curlex HV)	0.026	10.0	1.65
D	Ordinary Firm Loam (Ref 2)	0.020	3.5	2.0
E	Grass Lined (Ref 2)	0.030	5.0	2.0
F	6" Rip Rap (Ref 2, Ref 1)	0.069	9.0	2.0
G	Unvegetated Turf Reinforcement Mat (TRM) (NAG C350)	0.025	9.5	2.25
H	Class D Phase 2 (Partially vegetated) TRM (NAG C350)	0.048	14.0	3.34
I	12" Rip Rap (Ref 2, Ref 1)	0.078	12.5	4.0
J	Class B Phase 3 (Fully vegetated) TRM (NAG C350)	0.048	18.0	5.7
K	Concrete (HEC-15, EPA 832-F-99-002)	0.013	25.0	10.0

HDR Computation

Job No. 1743-2889-018

Project: SPSA Cell VII	Computed: GMW	Date: 2/11/09
Subject: Storm Water Drainage	Checked PAW	Date 2-12-09
Task: Perimeter Channels	Sheet 2	Of 2

Select Lining System for each channel slope that will handle the design flow when vegetated and when initially constructed.

Channel Bottom Slope around Cell V & VI varies from 0.2% to 0.4%.
Assume channel slope around Cell VII will be constucted as 0.4%.

Lining Type	Channel Slope	Z_{req}	Flow Depth d (ft)	Cross Sectional Area (sf)	R	Z_{avail}	Velocity (ft/sec)	Average Shear Stress (lb/sf)	
Permanent Lining									
E	0.4%	34.74	2.2	26.48	1.50	34.74	4.1	0.5	
E	0.2%	49.14	2.6	33.98	1.74	49.14	3.2	0.3	
Initial Lining									
D	0.4%	23.16	1.7	19.85	1.26	23.16	5.5	0.4	Need Temp Lining
D	0.2%	32.76	2.1	25.39	1.47	32.76	4.3	0.3	
Temporary Lining									
B	0.4%	39.38	2.3	28.97	1.58	39.38	3.8	0.6	
B	0.2%	55.69	2.8	37.21	1.83	55.69	2.9	0.3	

CONCLUSION

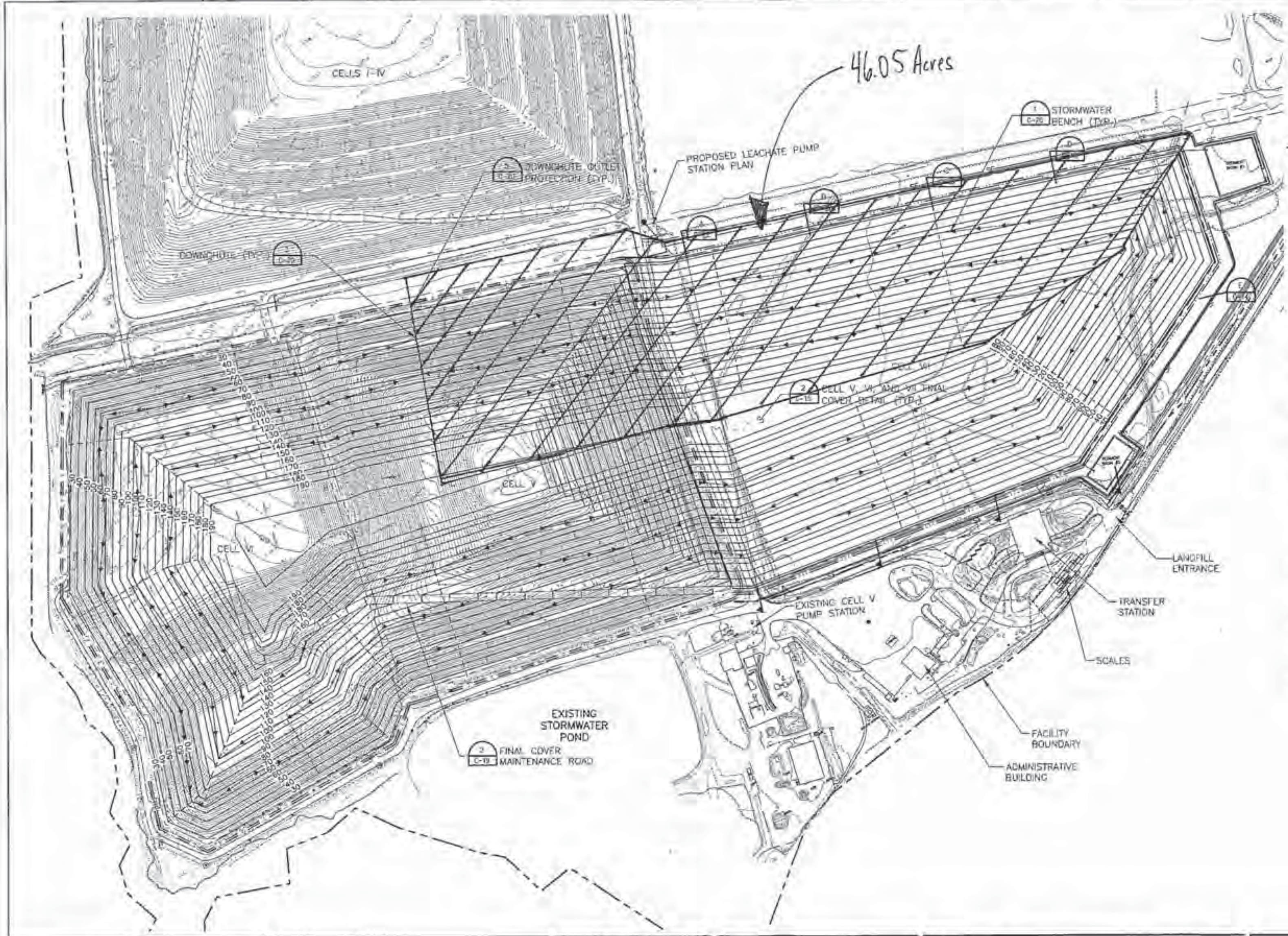
1. The above calculations are for the "Worst Case Scenario" or largest drainage area that drains to a perimeter ditch around Cell V & VII.

   Drainage area= 46.05 ac
   Base (ft) = 8
   Depth (ft) = 2.8
   Side Slope= 2H:1V
   Channel Slope = 0.4%

2. The perimeter channel design approved for Cell VI, are as follows:

   Bottom Width (ft) = 8
   Side Slopes = 2H:1V
   Depth = 3

3. Permanent lining shall be grass and the temporary lining shall be Curlex I.



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LEGEND

EXISTING CONTOURS
—20— FINAL COVER GRADES
CONSTRUCTION BASELINE
FACILITY BOUNDARY
SILT FENCE
SIDESLOPE BENCH
DOWNCHUTE
PROPERTY BOUNDARY
PERIMETER CHANNEL

HDR

HDR Engineering, Inc.
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[illegible]

ISSUE	DATE	DESCRIPTION
B	01/2009	REVISED DISPOSAL LIMITS
A	08/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002869.018

SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK
VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

0 1" 2"

FILENAME	00C-09.dwg
SCALE	1"=200'

SHEET
FIG 3

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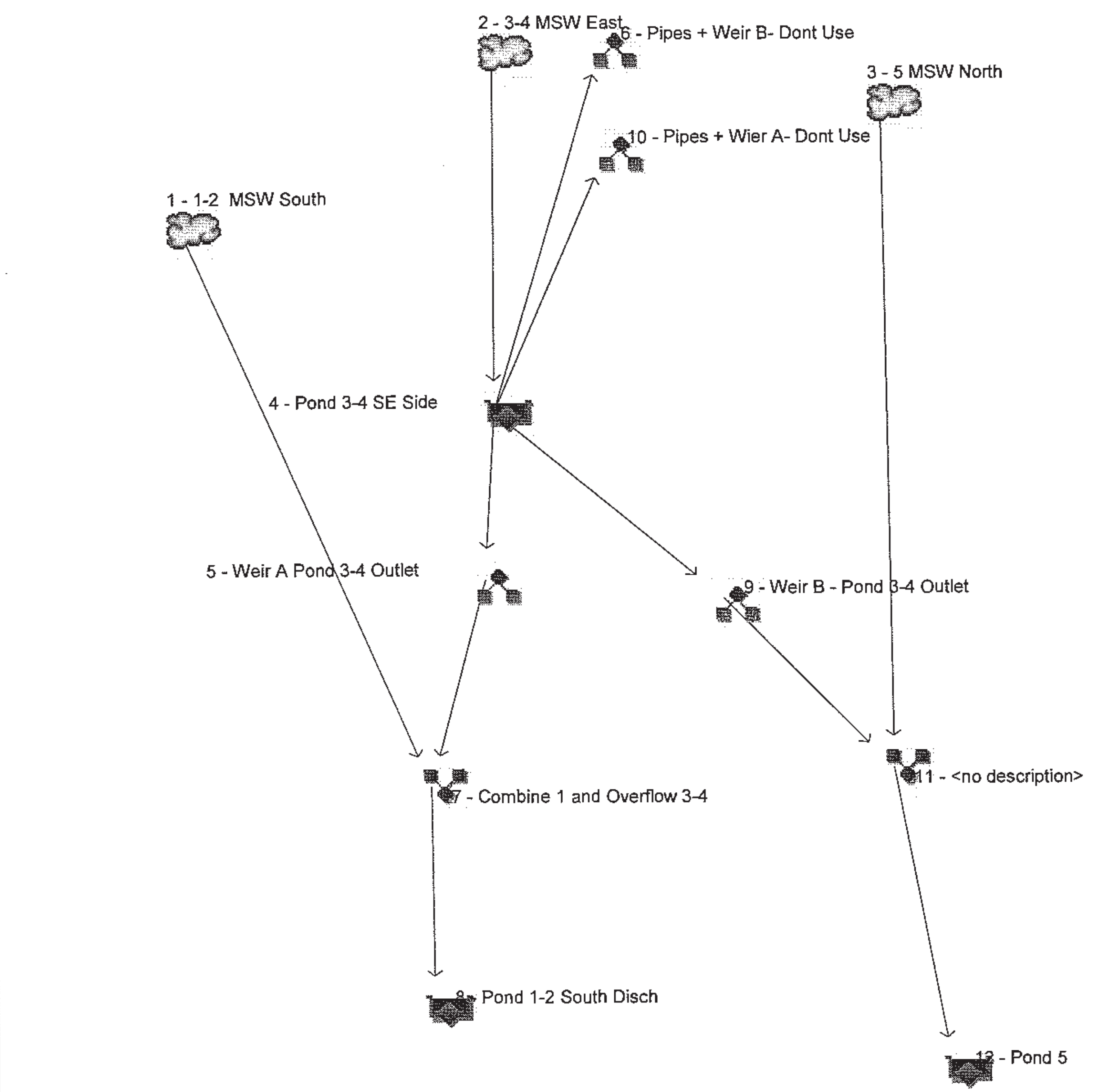
Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052



Project: SPSA Channels w weirs-REV.gpw	Thursday, Feb 12, 2009

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	142.36	1	727	12.330	------	------	------	1-2 MSW South
2	SCS Runoff	264.00	1	727	22.866	------	------	------	3-4 MSW East
3	SCS Runoff	113.68	1	727	9.847	------	------	------	5 MSW North
4	Reservoir	181.43	1	736	21.678	2	23.63	3.83	Pond 3-4 SE Side
5	Diversion1	82.91	1	736	7.613	4	------	------	Weir A Pond 3-4 Outlet
6	Diversion2	98.52	1	736	14.064	4	------	------	Pipes + Weir B- Dont Use
7	Combine	208.07	1	729	19.944	1, 5,	------	------	Combine 1 and Overflow 3-4
8	Reservoir	175.40	1	737	19.774	7	17.07	1.85	Pond 1-2 South Disch
9	Diversion1	55.54	1	736	2.782	4	------	------	Weir B - Pond 3-4 Outlet
10	Diversion2	125.90	1	736	18.895	4	------	------	Pipes + Wier A- Dont Use
11	Combine	154.65	1	729	12.629	3, 9,	------	------	<no description>
12	Reservoir	127.38	1	738	12.629	11	21.52	1.71	Pond 5

SPSA Channels w weirs-REV.gpw	Return Period: 25 Year	Thursday, Feb 12, 2009

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

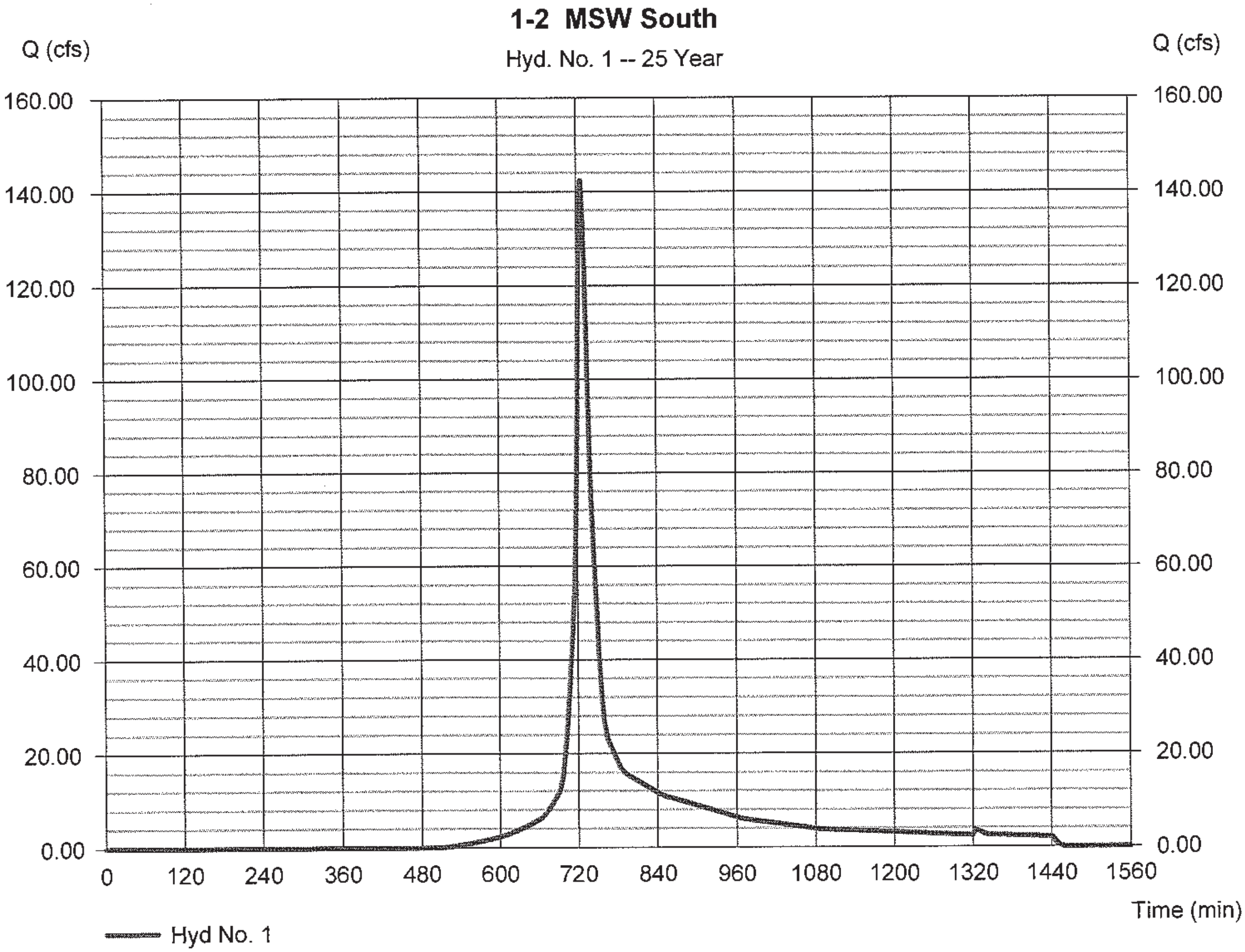
Thursday, Feb 12, 2009

Hyd. No. 1

1-2 MSW South

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 42.200 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.90 in
Storm duration = 24 hrs

Peak discharge = 142.36 cfs
Time to peak = 727 min
Hyd. volume = 12.330 acft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 256



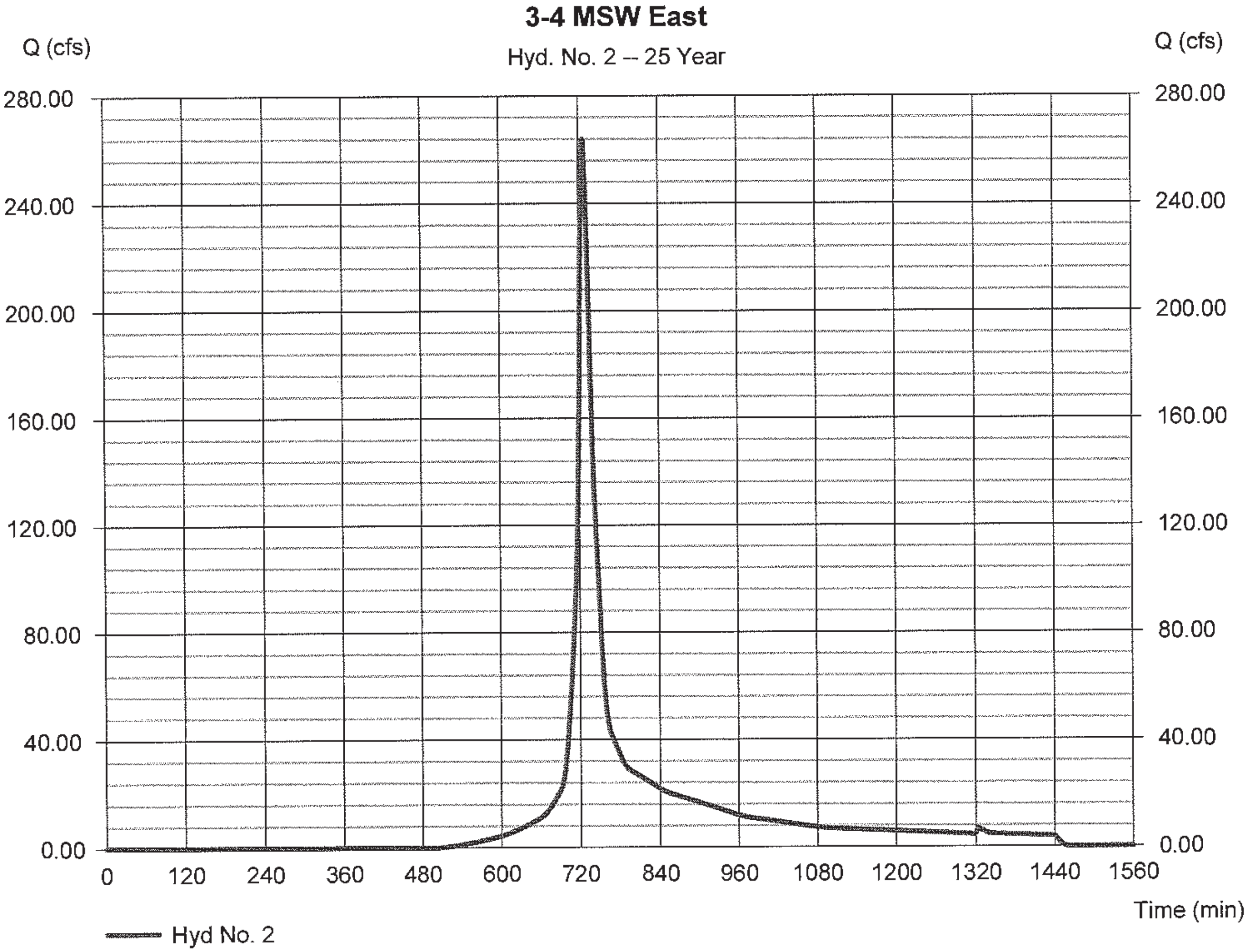
Hydrograph Report

Hyd. No. 2

3-4 MSW East

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 78.260 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.90 in
Storm duration = 24 hrs

Peak discharge = 264.00 cfs
Time to peak = 727 min
Hyd. volume = 22.866 acft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 256



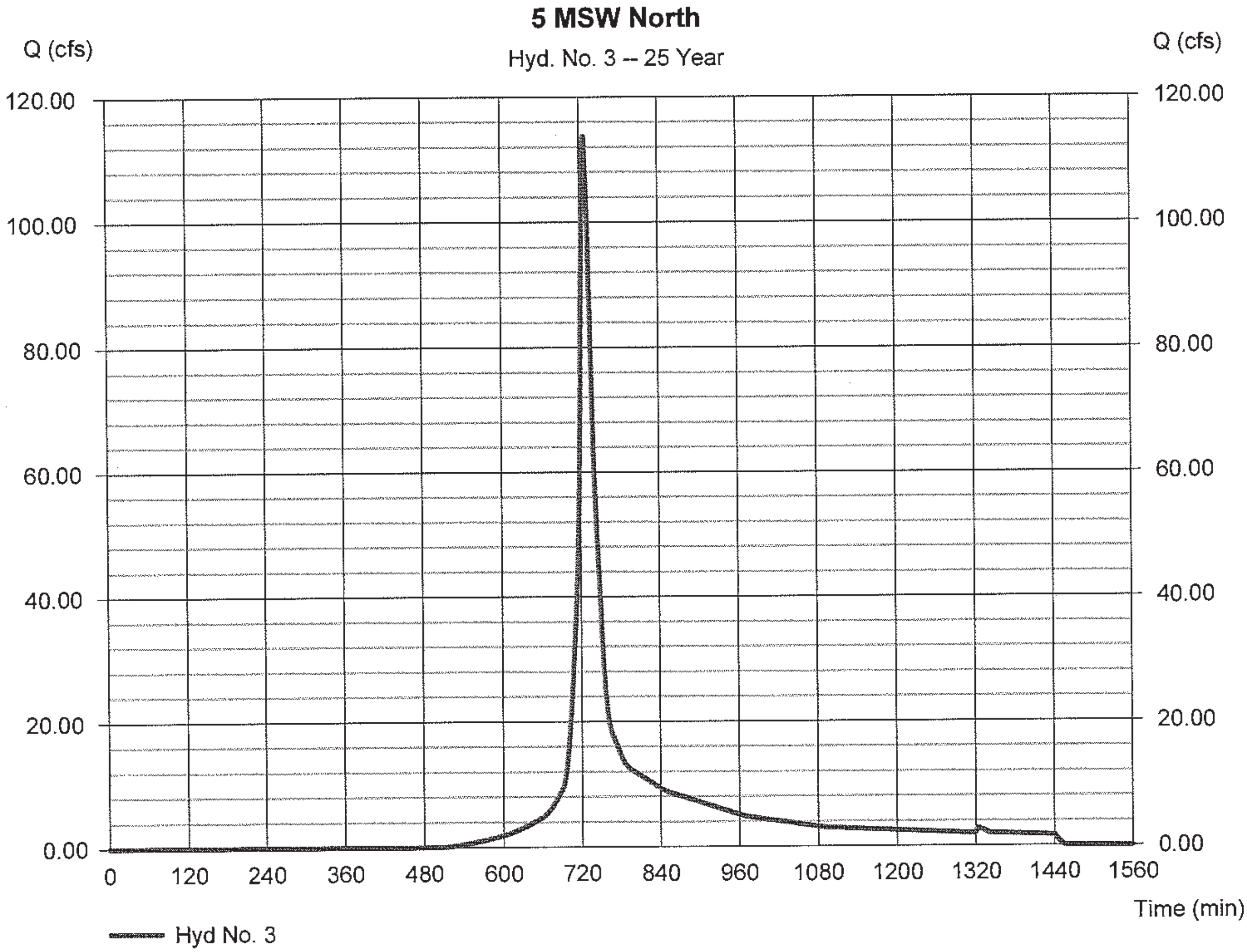
Hydrograph Report

Hyd. No. 3

5 MSW North

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 33.700 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.90 in
Storm duration = 24 hrs

Peak discharge = 113.68 cfs
Time to peak = 727 min
Hyd. volume = 9.847 acft
Curve number = 70
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 256



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Thursday, Feb 12, 2009

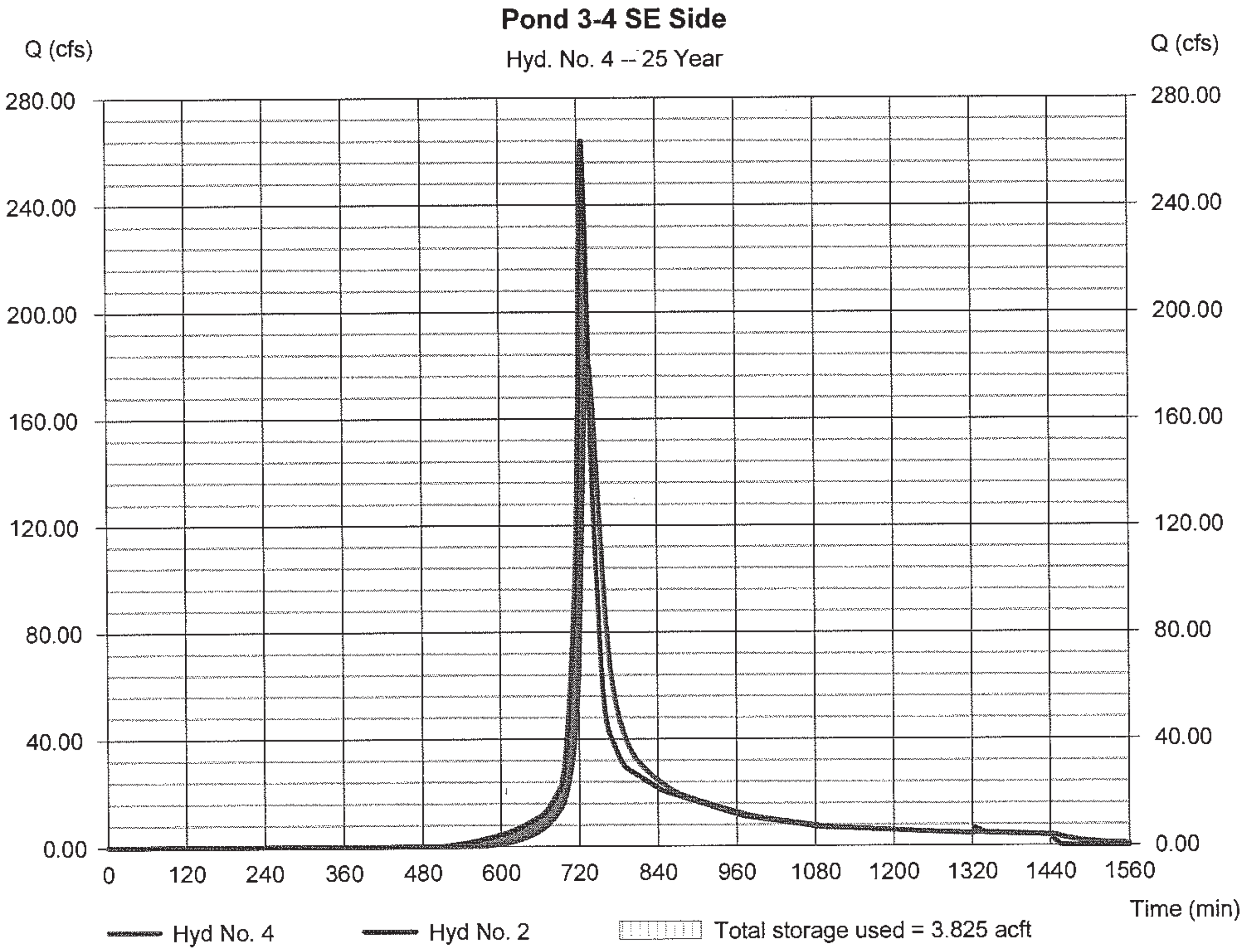
Hyd. No. 4

Pond 3-4 SE Side

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 2 - 3-4 MSW East
Reservoir name = 3-4 Pond

Peak discharge = 181.43 cfs
Time to peak = 736 min
Hyd. volume = 21.678 acft
Max. Elevation = 23.63 ft
Max. Storage = 3.825 acft

Storage Indication method used.



Pond 3-4 SE Side

Hyd. No. 4 -- 25 Year

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

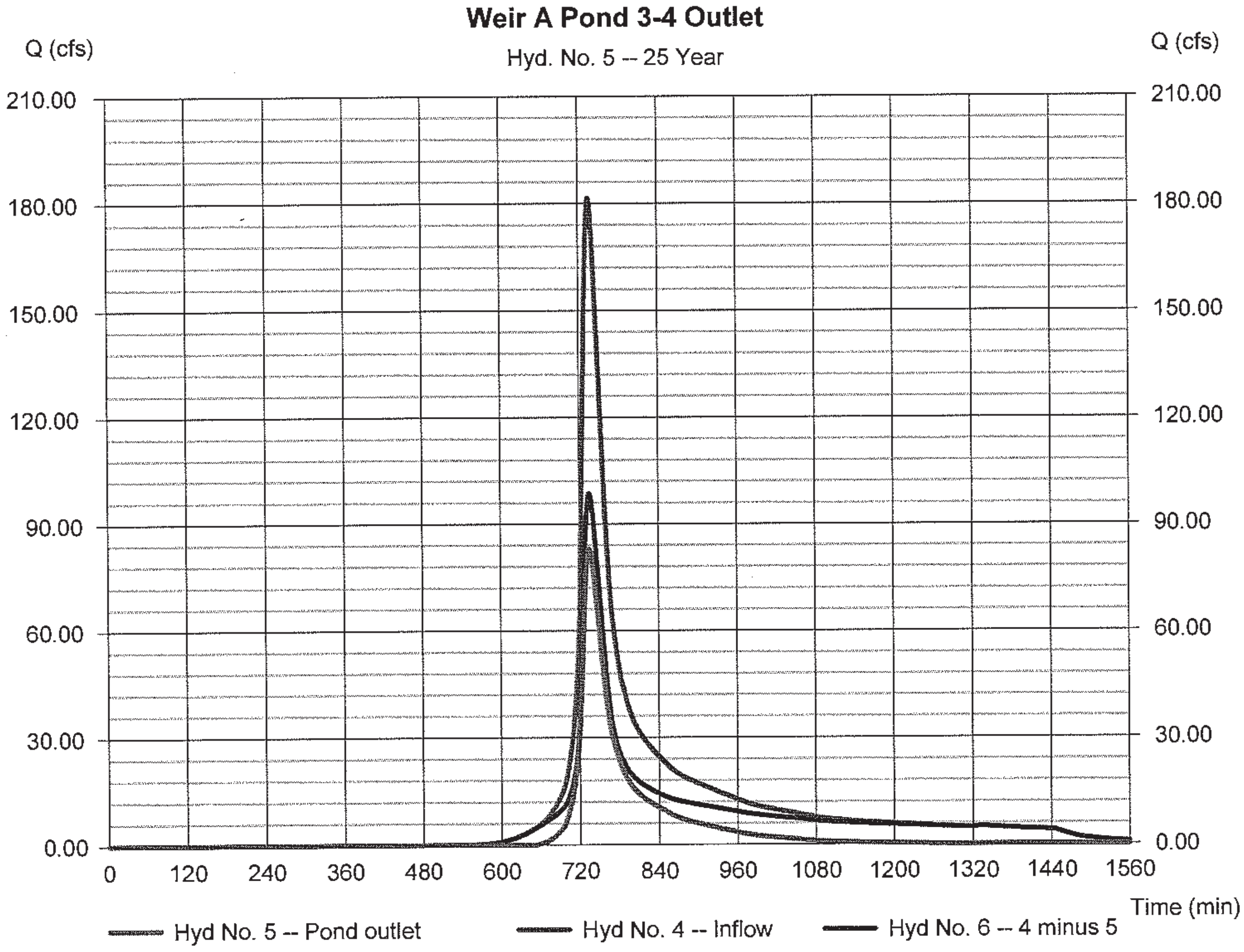
Thursday, Feb 12, 2009

Hyd. No. 5

Weir A Pond 3-4 Outlet

Hydrograph type = Diversion1
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hydrograph = 4 - Pond 3-4 SE Side
Diversion method = Pond - 3-4 Pond

Peak discharge = 82.91 cfs
Time to peak = 736 min
Hyd. volume = 7.613 acft
2nd diverted hyd. = 6
Pond structure = Weir A



Hydrograph Report

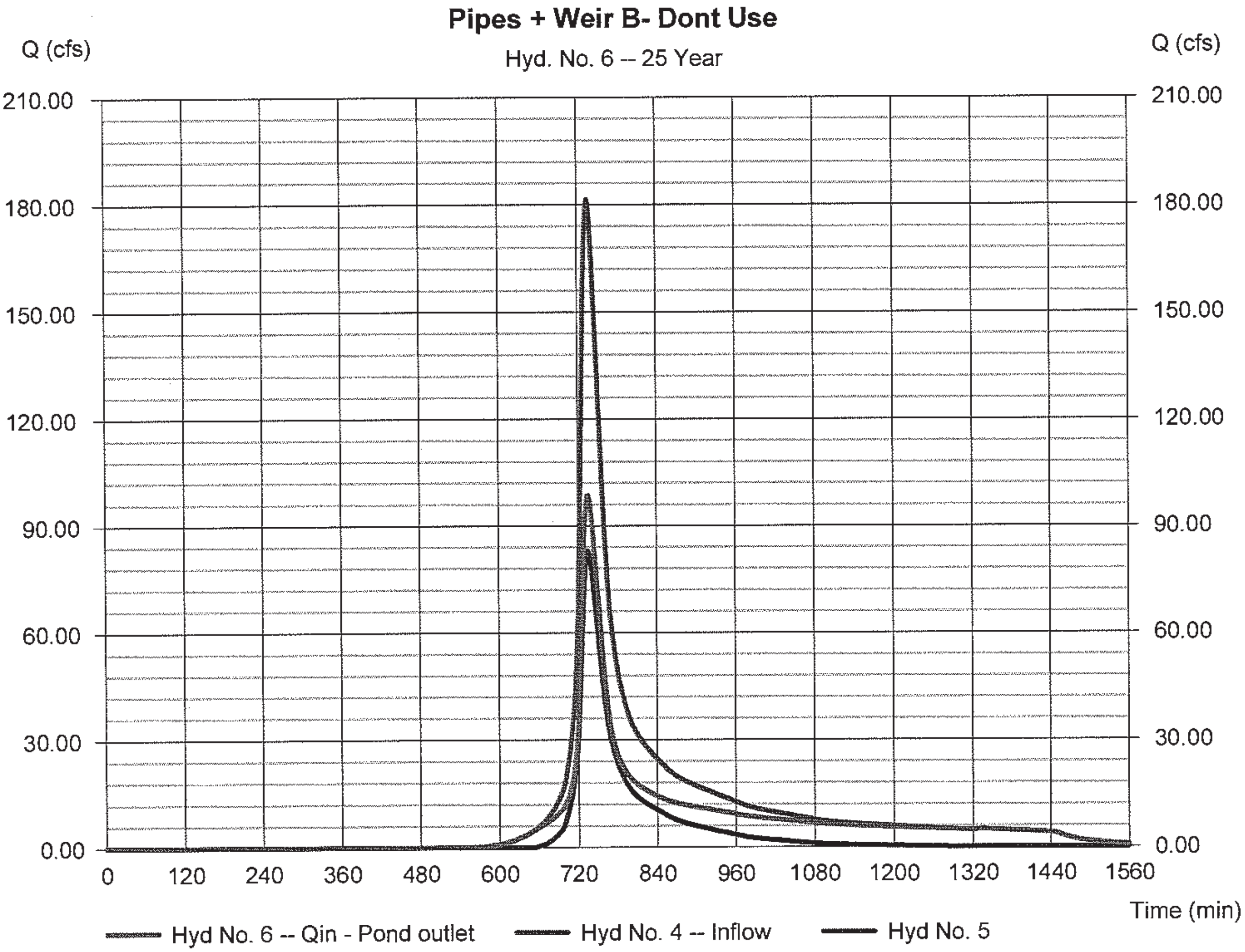
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052 Thursday, Feb 12, 2009

Hyd. No. 6

Pipes + Weir B- Dont Use

Hydrograph type = Diversion2
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hydrograph = 4 - Pond 3-4 SE Side
Diversion method = Pond - 3-4 Pond

Peak discharge = 98.52 cfs
Time to peak = 736 min
Hyd. volume = 14.064 acft
2nd diverted hyd. = 5
Pond structure = Weir A



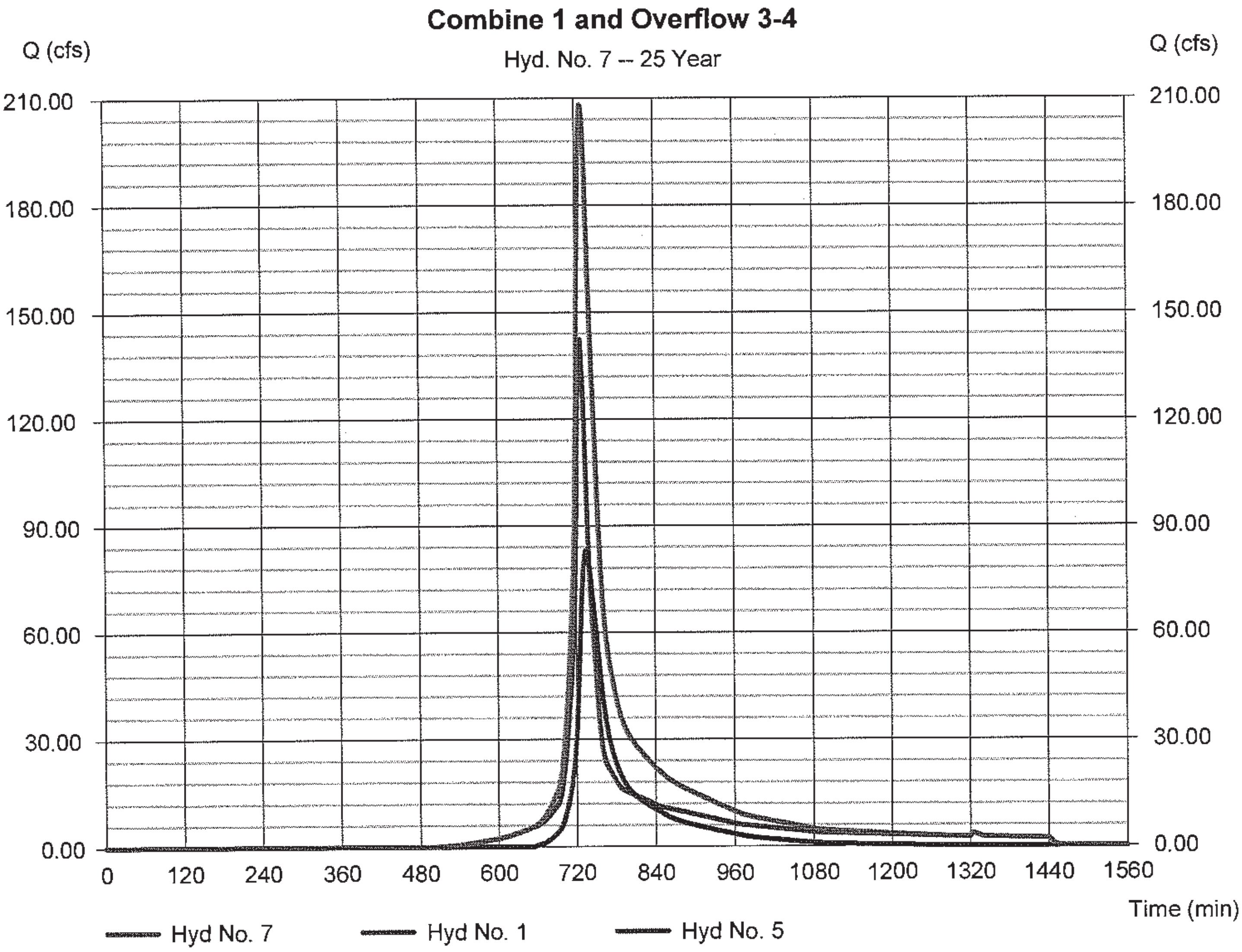
Hydrograph Report

Hyd. No. 7

Combine 1 and Overflow 3-4

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 1, 5

Peak discharge = 208.07 cfs
Time to peak = 729 min
Hyd. volume = 19.944 acft
Contrib. drain. area= 42.200 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

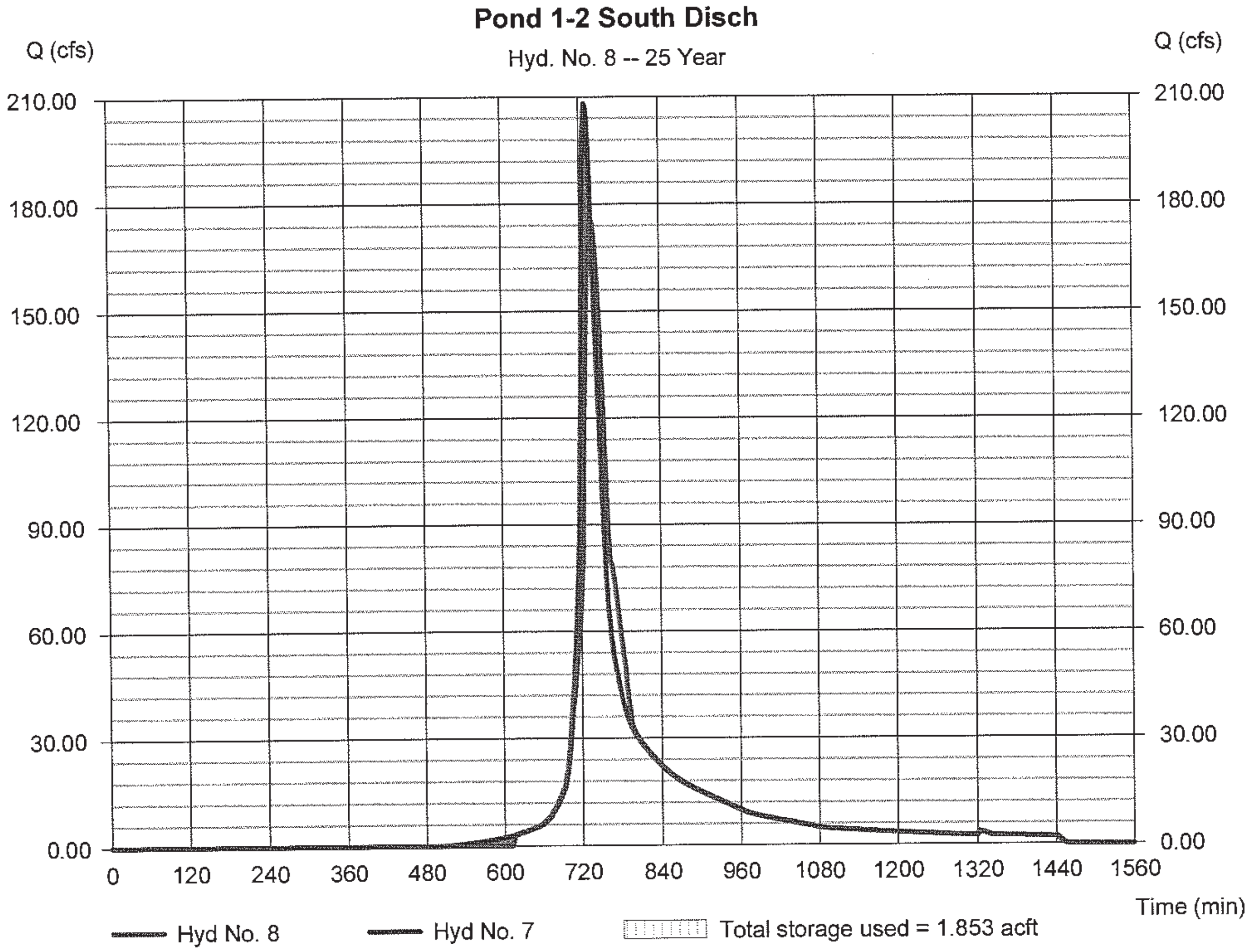
Thursday, Feb 12, 2009

Hyd. No. 8

Pond 1-2 South Disch

Hydrograph type	= Reservoir	Peak discharge	= 175.40 cfs
Storm frequency	= 25 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 19.774 acft
Inflow hyd. No.	= 7 - Combine 1 and Overflow 3-4	Max. Elevation	= 17.07 ft
Reservoir name	= Pond 1-2	Max. Storage	= 1.853 acft

Storage Indication method used.



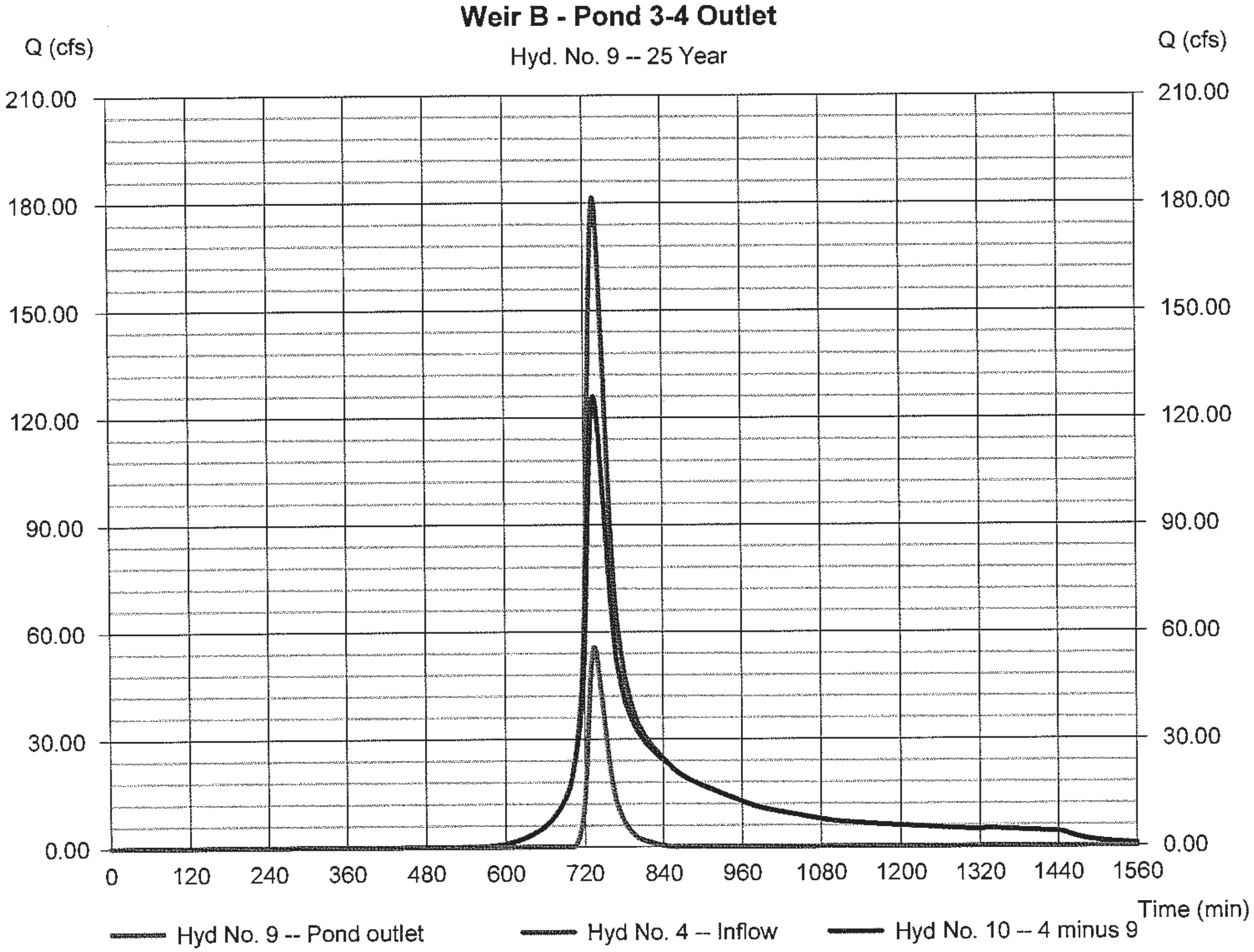
Hydrograph Report

Hyd. No. 9

Weir B - Pond 3-4 Outlet

Hydrograph type = Diversion1
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hydrograph = 4 - Pond 3-4 SE Side
Diversion method = Pond - 3-4 Pond

Peak discharge = 55.54 cfs
Time to peak = 736 min
Hyd. volume = 2.782 acft
2nd diverted hyd. = 10
Pond structure = Weir B



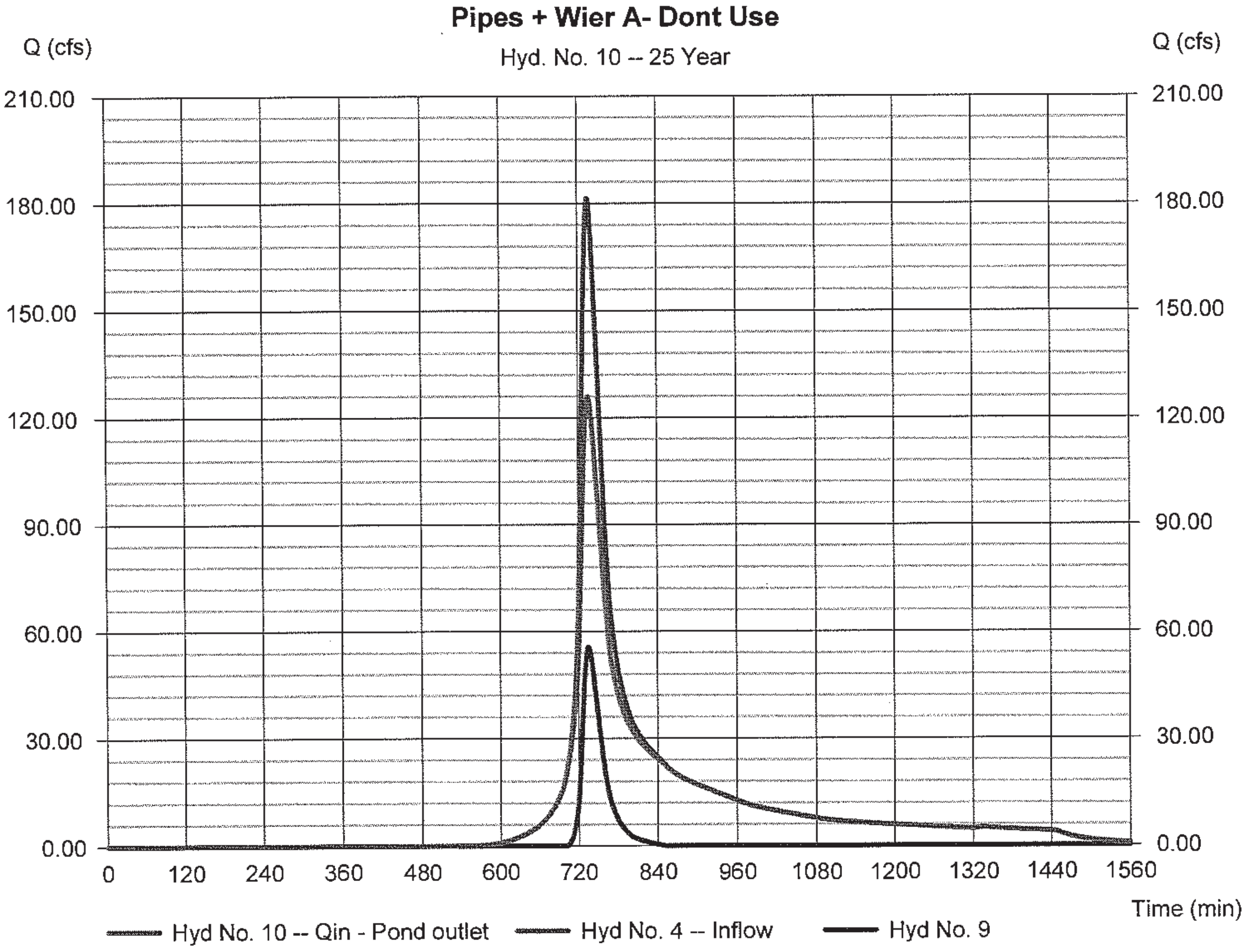
Hydrograph Report

Hyd. No. 10

Pipes + Wier A- Dont Use

Hydrograph type = Diversion2
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hydrograph = 4 - Pond 3-4 SE Side
Diversion method = Pond - 3-4 Pond

Peak discharge = 125.90 cfs
Time to peak = 736 min
Hyd. volume = 18.895 acft
2nd diverted hyd. = 9
Pond structure = Weir B



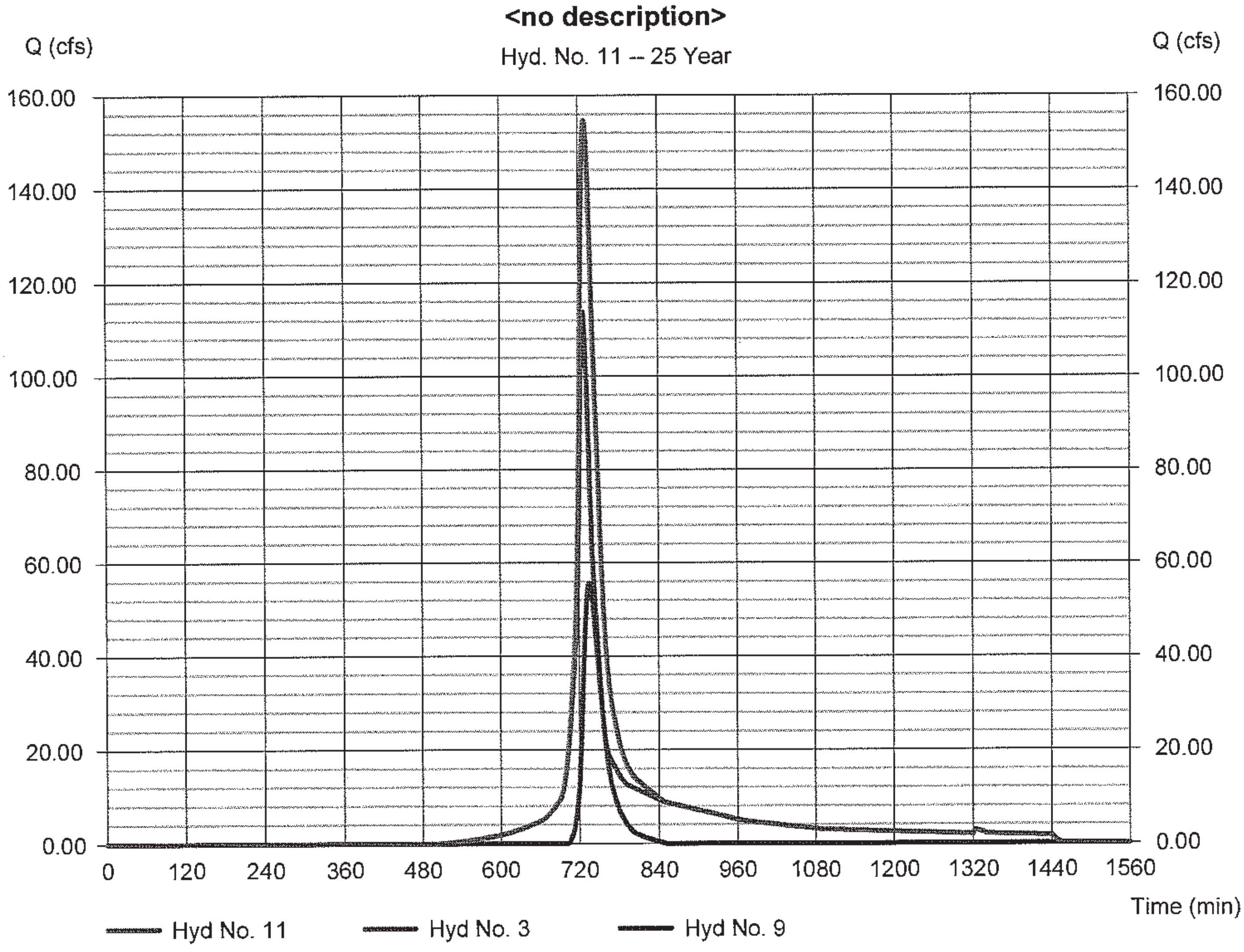
Hydrograph Report

Hyd. No. 11

<no description>

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 3, 9

Peak discharge = 154.65 cfs
Time to peak = 729 min
Hyd. volume = 12.629 acft
Contrib. drain. area = 33.700 ac



Hydrograph Report

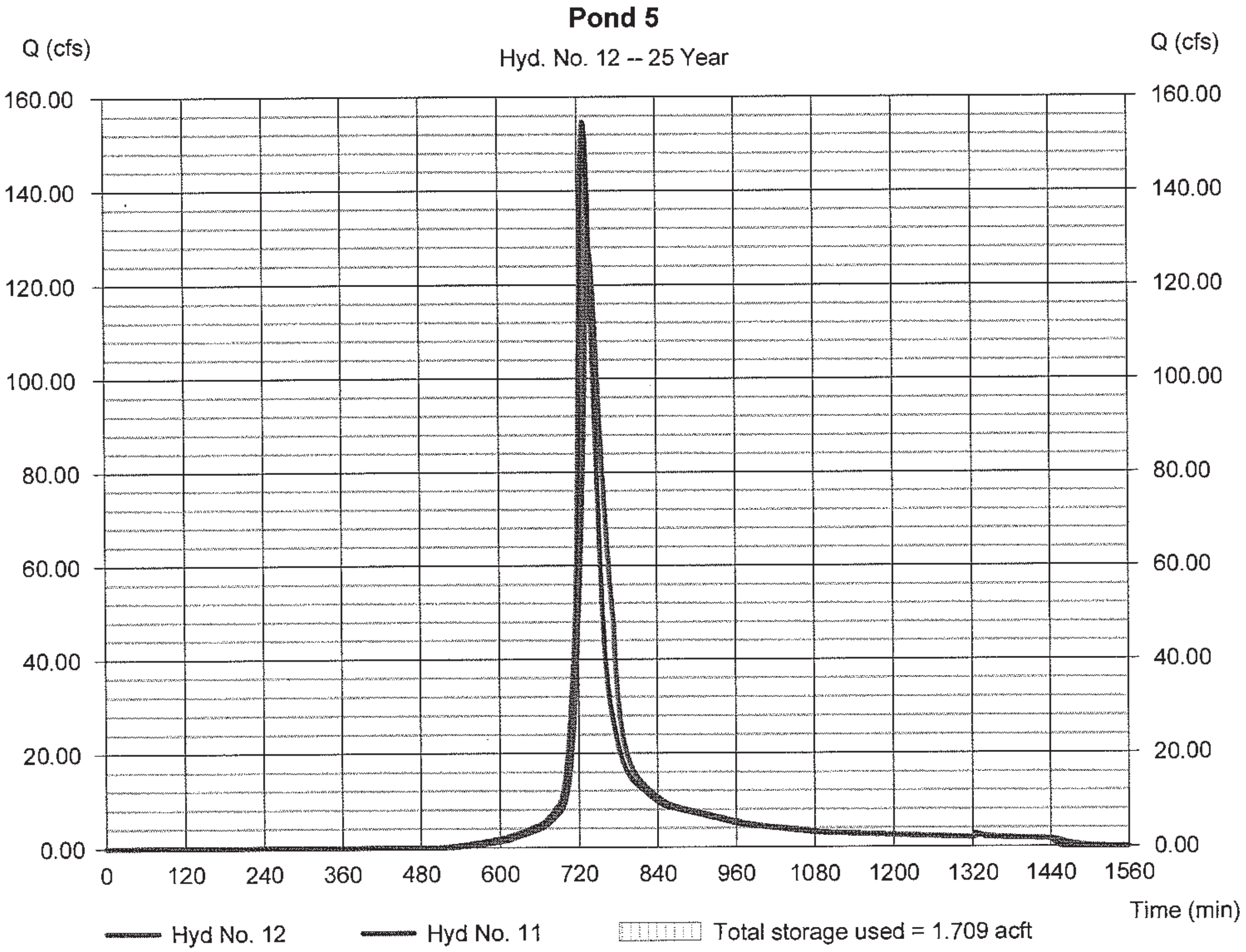
Hyd. No. 12

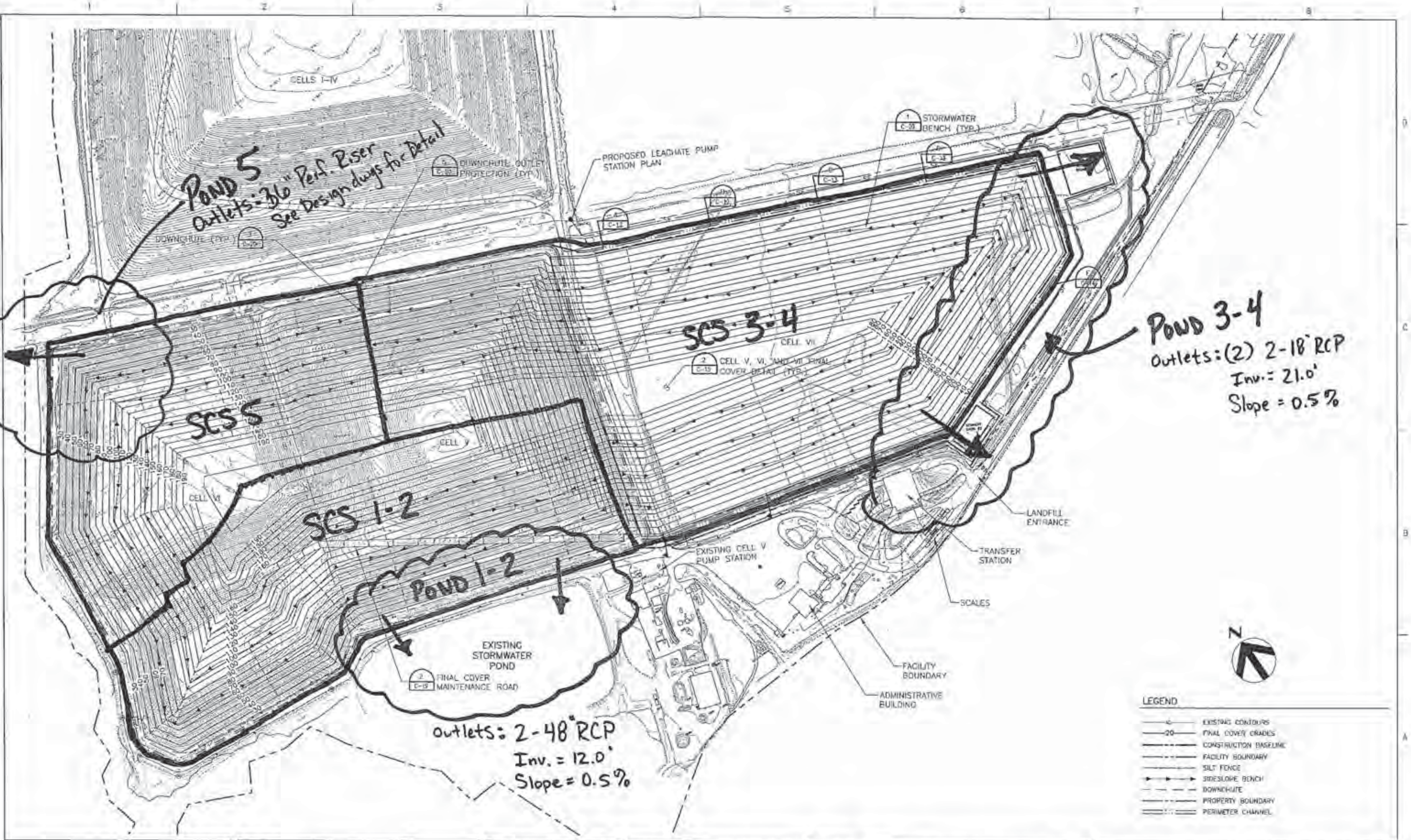
Pond 5

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 11 - <no description>
Reservoir name = Pond 5

Peak discharge = 127.38 cfs
Time to peak = 738 min
Hyd. volume = 12.629 acft
Max. Elevation = 21.52 ft
Max. Storage = 1.709 acft

Storage Indication method used.





HDR

HDR Engineering, Inc. of the Carolinas

ISSUE	DATE	DESCRIPTION
A	8/2008	ISSUED FOR APPROVAL

PROJECT MANAGER	D.T. DECESARE, P.E.
	T.M. YANOSCHAK, P.E.
	G.M. WILLIAMS, E.I.
PROJECT NUMBER	00002589.018

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SPSA

Regional Landfill Cell VII Expansion

Part B Application

SUFFOLK VIRGINIA

FINAL GRADING AND DRAINAGE PLAN

FILENAME 00C-09.dwg

SCALE 1"=200'

SHEET C-09

C:\PWworki... \dms93507\00C-09.DWG, Plot, 8/29/2008 9:29:13 AM, gwilliam

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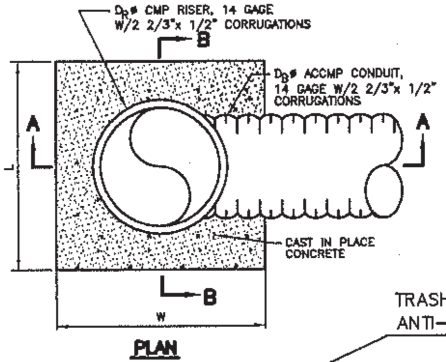
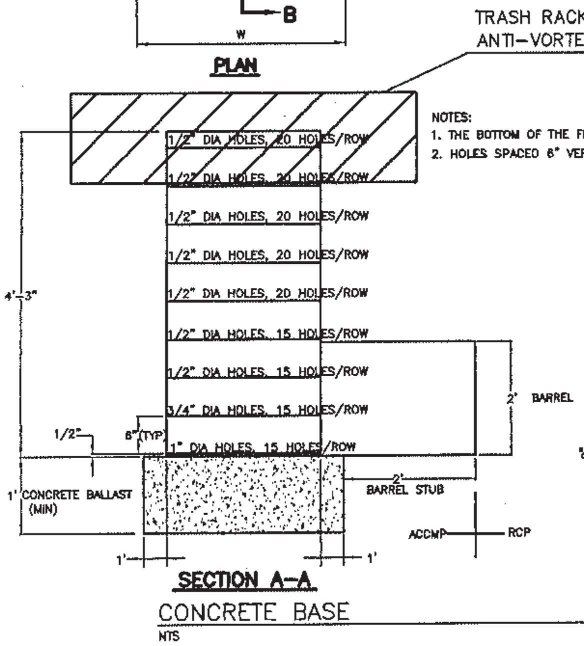
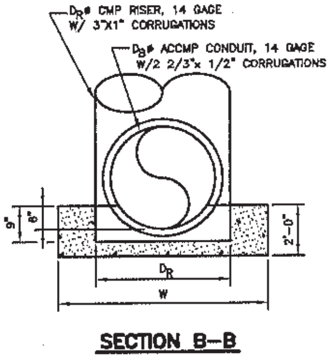


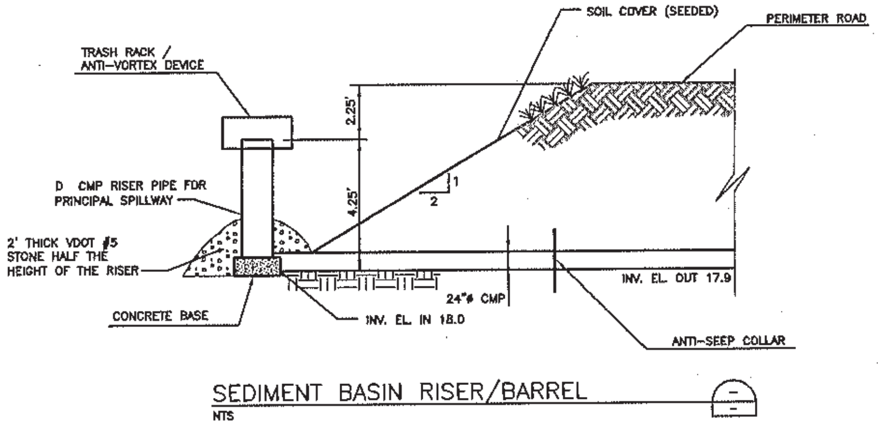
SB	DR (IN)	W (FT)	L (FT)	DB (IN)
1	36	5	5	24



NOTES:
1. THE BOTTOM OF THE FIRST ROW OF HOLES IS AT THE INVERT OF THE BARREL.
2. HOLES SPACED 6" VERTICALLY FROM BOTTOM ROW.



CONCRETE BASE
NTS



SEDIMENT BASIN RISER/BARREL
NTS

HDR

HDR Engineering, Inc.
of the Carolinas

128 S Tryon Street, Suite 1400 | Charlotte, NC 28202

STORM DRAINAGE
PERFORATED RISER DETAIL

DATE
8/29/08

FIGURE
1

C:\Program Files\Bentley\ProjectWise_XM\bin\Drawing2.dwg, Layout1, 8/29/2008 3:02:20 PM, gwilliam

SPSA Borrow Area

Sediment Basin # 1

25 - year Storm Event
Post Development
HDR Project No.01743-2889-018

Qp =	135.4	cfs
Tp =	27.9	minutes
dT = Max oi	3	minutes
or	2.0%	of increment to peak

b = 1.9
Ks = 6,537

Diameter of Barrel =	24	(in)		
Height of Riser above barrel =	2.25	(ft)	elevation	20.25
ight of Riser from bottom of barrel=	4.25	(ft)	elevation	22.25
Emergency Spillway =	5.00	(ft)	elevation	23.00
Total Height of Dam =	6.00	(ft)	elevation	24.00
Length of Emergency Spillway =	8	(ft)		
Diameter of Riser =	36	(in)		
Permanent Pond Stage =	0	(ft)	elevation	18.0

5.9E-03 Settling Velocity of design particle (fps)
2 Effective number of cells (2 is construction site #)

93% Minimum Settling Efficiency
6.0 ft Maximum Stage 24.00 msl elevation
58.5 cfs Peak outflow
33.8 cfs Peak Barrel outflow
24.7 cfs peak weir flow

Notes:

1. Length of emergency spillway is the bottom width of the emergency spillway.
2. Settling efficiency neglects permanent pond volume

TIME [min]	INFLOW [cfs]	STORAGE [cu ft]	STAGE [ft]	PERF FLOW [cfs]	RISER CAPACITY [cfs]	WEIR FLOW [cfs]	BARREL CAPACITY [cfs]	TOTAL OUTFLOW [cfs]	BOUND DISCHG [cfs]	Est. Surface Area (sf)	SETTLING EFF. [%]
0	0.0	0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	-	N/A
3	3.8	0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	-	N/A
6	14.9	691	0.3	0.18	0.18	0.00	0.18	0.18	9.46	4,298	100%
9	32.0	3,344	0.7	0.38	0.38	0.00	0.38	0.38	19.66	8,936	100%
12	53.1	9,032	1.2	0.62	0.62	0.00	0.62	0.62	31.18	14,172	100%
15	75.9	18,476	1.7	0.86	0.86	0.00	0.86	0.86	43.46	19,756	100%
18	97.7	31,975	2.3	1.15	1.15	0.00	1.15	1.15	56.06	25,483	100%
21	116.1	49,353	3.0	1.45	1.45	0.00	1.45	1.45	68.57	31,169	100%
24	129.1	69,995	3.6	1.78	1.78	0.00	1.78	1.78	80.65	36,657	100%
27	135.1	92,909	4.1	2.15	2.15	0.00	2.15	2.15	91.97	41,806	100%
30	133.4	116,833	4.7	2.46	11.50	0.00	29.01	11.50	102.29	46,496	99%
33	124.3	138,776	5.1	2.67	28.86	1.28	30.74	30.14	110.80	50,362	97%
36	109.5	155,725	5.5	2.79	44.67	7.72	31.93	39.65	116.88	53,129	96%
39	95.2	168,297	5.7	2.81	57.22	14.11	32.75	46.86	121.17	55,078	95%
42	82.8	176,997	5.9	2.81	66.22	19.07	33.29	52.36	124.04	56,382	94%
45	71.9	182,469	6.0	2.81	72.01	22.37	33.62	55.99	125.81	57,184	94%
48	62.5	185,341	6.0	2.81	75.08	24.15	33.79	57.94	126.72	57,600	94%
51	54.4	186,170	6.0	2.81	75.97	24.67	33.83	58.51	126.98	57,719	93%
54	47.3	185,425	6.0	2.81	75.17	24.21	33.79	58.00	126.75	57,612	94%
57	41.1	183,494	6.0	2.81	73.10	23.00	33.68	56.68	126.13	57,333	94%
60	35.7	180,689	5.9	2.81	70.12	21.28	33.51	54.79	125.23	56,925	94%
63	31.1	177,256	5.9	2.81	66.49	19.22	33.30	52.53	124.12	56,420	94%
66	27.0	173,392	5.8	2.81	62.46	16.97	33.07	50.03	122.86	55,846	95%
69	23.5	169,246	5.7	2.81	58.19	14.63	32.81	47.44	121.49	55,222	95%
72	20.4	164,932	5.6	2.81	53.80	12.30	32.53	44.83	120.04	54,564	95%
75	17.7	160,535	5.6	2.81	49.41	10.04	32.25	42.29	118.55	53,884	96%
78	15.4	156,117	5.5	2.79	45.05	7.90	31.95	39.86	117.02	53,191	96%
81	13.4	151,719	5.4	2.77	40.80	5.92	31.66	37.58	115.48	52,490	96%
84	11.7	147,368	5.3	2.73	36.68	4.14	31.35	35.50	113.93	51,786	96%
87	10.1	143,076	5.2	2.69	32.71	2.59	31.05	33.64	112.38	51,081	97%
90	8.8	138,845	5.1	2.67	28.92	1.30	30.74	30.22	110.82	50,374	97%
93	7.7	134,990	5.1	2.62	25.56	0.41	30.45	25.97	109.38	49,720	98%
96	6.7	131,695	5.0	2.60	22.78	0.00	30.20	22.78	108.14	49,153	98%
99	5.8	128,792	4.9	2.58	20.41	0.00	29.98	20.41	107.02	48,647	98%
102	5.0	126,160	4.9	2.56	18.32	0.00	29.77	18.32	106.00	48,183	99%
105	4.4	123,768	4.8	2.53	16.48	0.00	29.58	16.48	105.07	47,757	99%
108	3.8	121,588	4.8	2.51	14.85	0.00	29.40	14.85	104.20	47,365	99%
111	3.3	119,599	4.7	2.49	13.41	0.00	29.24	13.41	103.41	47,004	99%
114	2.9	117,779	4.7	2.46	12.14	0.00	29.09	12.14	102.67	46,670	99%
117	2.5	116,112	4.7	2.44	11.00	0.00	28.95	11.00	102.00	46,363	99%
120	2.2	114,582	4.6	2.44	10.02	0.00	28.81	10.02	101.37	46,078	100%
123	1.9	113,170	4.6	2.41	9.11	0.00	28.69	9.11	100.79	45,814	100%
126	1.6	111,869	4.6	2.39	8.31	0.00	28.58	8.31	100.25	45,569	100%
129	1.4	110,669	4.6	2.39	7.61	0.00	28.47	7.61	99.75	45,341	100%
132	1.2	109,555	4.5	2.36	6.97	0.00	28.38	6.97	99.28	45,129	100%

135	1.1	108,525	4.5	2.36	6.41	0.00	28.28	6.41	98.85	44,931	100%
138	0.9	107,564	4.5	2.36	5.92	0.00	28.20	5.92	98.44	44,746	100%
141	0.8	106,668	4.5	2.33	5.45	0.00	28.12	5.45	98.06	44,573	100%
144	0.7	105,834	4.4	2.33	5.05	0.00	28.04	5.05	97.70	44,411	100%
147	0.6	105,053	4.4	2.31	4.67	0.00	27.97	4.67	97.37	44,258	100%
150	0.5	104,324	4.4	2.31	4.35	0.00	27.90	4.35	97.05	44,115	100%
153	0.5	103,638	4.4	2.31	4.06	0.00	27.84	4.06	96.76	43,981	100%
156	0.4	102,990	4.4	2.28	3.78	0.00	27.78	3.78	96.48	43,853	100%
159	0.4	102,383	4.4	2.28	3.55	0.00	27.72	3.55	96.21	43,733	100%
162	0.3	101,808	4.4	2.28	3.34	0.00	27.66	3.34	95.96	43,619	100%
165	0.3	101,261	4.3	2.28	3.16	0.00	27.61	3.16	95.72	43,510	100%
168	0.2	100,741	4.3	2.25	2.96	0.00	27.56	2.96	95.49	43,406	100%
171	0.2	100,249	4.3	2.25	2.82	0.00	27.52	2.82	95.28	43,307	100%
174	0.2	99,778	4.3	2.25	2.69	0.00	27.47	2.69	95.07	43,213	100%
177	0.2	99,325	4.3	2.25	2.58	0.00	27.43	2.58	94.87	43,121	100%
180	0.1	98,888	4.3	2.25	2.48	0.00	27.39	2.48	94.67	43,033	100%
184	0.1	98,324	4.3	2.22	2.34	0.00	27.33	2.34	94.42	42,919	100%
188	0.1	97,789	4.3	2.22	2.26	0.00	27.28	2.26	94.18	42,811	100%
192	0.1	97,268	4.3	2.22	2.22	0.00	27.23	2.22	93.95	42,705	100%
196	0.1	96,753	4.2	2.22	2.22	0.00	2.22	2.22	93.72	42,600	100%
200	0.1	96,235	4.2	2.19	2.19	0.00	2.19	2.19	93.49	42,494	100%
204	0.0	95,723	4.2	2.19	2.19	0.00	2.19	2.19	93.25	42,389	100%
208	0.0	95,208	4.2	2.19	2.19	0.00	2.19	2.19	93.02	42,283	100%
212	0.0	94,692	4.2	2.19	2.19	0.00	2.19	2.19	92.79	42,176	100%
216	0.0	94,174	4.2	2.15	2.15	0.00	2.15	2.15	92.55	42,069	100%
220	0.0	93,663	4.2	2.15	2.15	0.00	2.15	2.15	92.32	41,963	100%
224	0.0	93,152	4.2	2.15	2.15	0.00	2.15	2.15	92.08	41,856	100%
228	0.0	92,639	4.1	2.15	2.15	0.00	2.15	2.15	91.85	41,749	100%
233	0.0	91,998	4.1	2.10	2.10	0.00	2.10	2.10	91.55	41,615	100%
238	0.0	91,371	4.1	2.10	2.10	0.00	2.10	2.10	91.26	41,483	100%
243	0.0	90,744	4.1	2.10	2.10	0.00	2.10	2.10	90.97	41,351	100%
248	0.0	90,116	4.1	2.08	2.08	0.00	2.08	2.08	90.68	41,218	100%
253	0.0	89,495	4.1	2.08	2.08	0.00	2.08	2.08	90.39	41,086	100%
258	0.0	88,874	4.0	2.08	2.08	0.00	2.08	2.08	90.10	40,953	100%
263	0.0	88,252	4.0	2.08	2.08	0.00	2.08	2.08	89.80	40,820	100%
268	0.0	87,631	4.0	2.05	2.05	0.00	2.05	2.05	89.51	40,686	100%
273	0.0	87,016	4.0	2.05	2.05	0.00	2.05	2.05	89.22	40,553	100%
278	0.0	86,401	4.0	2.05	2.05	0.00	2.05	2.05	88.92	40,420	100%
284	0.0	85,664	4.0	2.03	2.03	0.00	2.03	2.03	88.57	40,260	100%
290	0.0	84,935	4.0	2.03	2.03	0.00	2.03	2.03	88.22	40,100	100%
296	0.0	84,206	3.9	2.03	2.03	0.00	2.03	2.03	87.87	39,940	100%
302	0.0	83,477	3.9	2.00	2.00	0.00	2.00	2.00	87.51	39,779	100%
308	0.0	82,757	3.9	2.00	2.00	0.00	2.00	2.00	87.16	39,620	100%
314	0.0	82,037	3.9	1.97	1.97	0.00	1.97	1.97	86.81	39,460	100%
320	0.0	81,327	3.9	1.97	1.97	0.00	1.97	1.97	86.46	39,301	100%
326	0.0	80,617	3.8	1.97	1.97	0.00	1.97	1.97	86.11	39,141	100%
332	0.0	79,906	3.8	1.95	1.95	0.00	1.95	1.95	85.76	38,981	100%
339	0.0	79,089	3.8	1.95	1.95	0.00	1.95	1.95	85.35	38,795	100%
346	0.0	78,272	3.8	1.92	1.92	0.00	1.92	1.92	84.94	38,609	100%
353	0.0	77,467	3.8	1.92	1.92	0.00	1.92	1.92	84.53	38,424	100%
360	0.0	76,662	3.7	1.92	1.92	0.00	1.92	1.92	84.12	38,238	100%
367	0.0	75,857	3.7	1.89	1.89	0.00	1.89	1.89	83.71	38,051	100%
374	0.0	75,065	3.7	1.89	1.89	0.00	1.89	1.89	83.31	37,866	100%
381	0.0	74,273	3.7	1.85	1.85	0.00	1.85	1.85	82.90	37,680	100%
389	0.0	73,384	3.7	1.85	1.85	0.00	1.85	1.85	82.43	37,470	100%
397	0.0	72,495	3.6	1.80	1.80	0.00	1.80	1.80	81.97	37,259	100%

HELP MODEL

- OPEN7REV – Open Condition/No Waste
- SPSA71LTREV – First Lift/10’ Waste
- SPSA7RECREV – Second Lift with Recirculation/20’ Waste
- SPSA7PACREV – Intermediate Cover/170’ Waste
- SPSA7PCR – Intermediate Cover with Recirculation/170’ Waste
- SPSA7CLOREV – Closed Landfill

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************




PRECIPITATION DATA FILE:    H:\HELP307\SPSA7\SPSA7.D4
TEMPERATURE DATA FILE:      H:\HELP307\SPSA7\SPSA7.D7
SOLAR RADIATION DATA FILE:  H:\HELP307\SPSA7\SPSA7.D13
EVAPOTRANSPIRATION DATA:    H:\HELP307\SPSA7\SPSA7.D11
SOIL AND DESIGN DATA FILE:  H:\HELP307\SPSA7\SPSA7.D10
OUTPUT DATA FILE:           H:\HELP307\SPSA7\OPEN7REV.OUT


TIME:  10:58     DATE:   7/31/2008



******************************************************************************

     TITLE:  SPSA CELL 7 NO WASTE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                       TYPE 2 - LATERAL DRAINAGE LAYER
                         MATERIAL TEXTURE NUMBER  10
           THICKNESS                   =     18.00   INCHES
           POROSITY                    =      0.3980 VOL/VOL
           FIELD CAPACITY              =      0.2440 VOL/VOL
           WILTING POINT               =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT  =      0.2379 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                                   LAYER  2
                                   --------

                       TYPE 2 - LATERAL DRAINAGE LAYER
```

```
                 MATERIAL TEXTURE NUMBER   0
   THICKNESS                    =      0.30   INCHES
   POROSITY                     =      0.8500 VOL/VOL
   FIELD CAPACITY               =      0.0100 VOL/VOL
   WILTING POINT                =      0.0050 VOL/VOL
   INITIAL SOIL WATER CONTENT   =      0.0177 VOL/VOL
   EFFECTIVE SAT. HYD. COND.    =   26.2999992000     CM/SEC
   SLOPE                        =      2.50   PERCENT
   DRAINAGE LENGTH              =    265.0    FEET


                           LAYER  3
                           --------

               TYPE 4 - FLEXIBLE MEMBRANE LINER
                 MATERIAL TEXTURE NUMBER  35
   THICKNESS                    =      0.06   INCHES
   POROSITY                     =      0.0000 VOL/VOL
   FIELD CAPACITY               =      0.0000 VOL/VOL
   WILTING POINT                =      0.0000 VOL/VOL
   INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
   EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
   FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
   FML INSTALLATION DEFECTS     =      7.00   HOLES/ACRE
   FML PLACEMENT QUALITY        =  3 - GOOD


                           LAYER  4
                           --------

                 TYPE 3 - BARRIER SOIL LINER
                 MATERIAL TEXTURE NUMBER   0
   THICKNESS                    =      0.20   INCHES
   POROSITY                     =      0.7500 VOL/VOL
   FIELD CAPACITY               =      0.7470 VOL/VOL
   WILTING POINT                =      0.4000 VOL/VOL
   INITIAL SOIL WATER CONTENT   =      0.7500 VOL/VOL
   EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC


           GENERAL DESIGN AND EVAPORATIVE ZONE DATA
           ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE #10 WITH BARE
          GROUND CONDITIONS, A SURFACE SLOPE OF  2.% AND
          A SLOPE LENGTH OF  265. FEET.

SCS RUNOFF CURVE NUMBER               =     93.90
FRACTION OF AREA ALLOWING RUNOFF      =      0.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE    =      1.000  ACRES
EVAPORATIVE ZONE DEPTH                =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE     =      2.032  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE    =      3.980  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE    =      1.360  INCHES
INITIAL SNOW WATER                    =      0.000  INCHES
```

```
          INITIAL WATER IN LAYER MATERIALS    =      4.437  INCHES
          TOTAL INITIAL WATER                 =      4.437  INCHES
          TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR



                        EVAPOTRANSPIRATION AND WEATHER DATA
                        -----------------------------------

           NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                    NORFOLK               VIRGINIA

               STATION LATITUDE                         =  36.54 DEGREES
               MAXIMUM LEAF AREA INDEX                  =   0.00
               START OF GROWING SEASON (JULIAN DATE)    =    91
               END OF GROWING SEASON (JULIAN DATE)      =   306
               EVAPORATIVE ZONE DEPTH                   =  10.0  INCHES
               AVERAGE ANNUAL WIND SPEED                =   7.60 MPH
               AVERAGE 1ST QUARTER RELATIVE HUMIDITY    =  68.00 %
               AVERAGE 2ND QUARTER RELATIVE HUMIDITY    =  68.00 %
               AVERAGE 3RD QUARTER RELATIVE HUMIDITY    =  77.00 %
               AVERAGE 4TH QUARTER RELATIVE HUMIDITY    =  73.00 %


           NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
                    COEFFICIENTS FOR    NORFOLK             VIRGINIA

                    NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

       JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
       -------     -------     -------     -------     -------     -------
         3.72        3.28        3.86        2.87        3.75        3.45
         5.15        5.33        4.35        3.41        2.88        3.17


           NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                    COEFFICIENTS FOR    NORFOLK             VIRGINIA

               NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

       JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
       -------     -------     -------     -------     -------     -------
        39.90       41.10       48.50       58.20       66.40       74.30
        78.40       77.70       72.20       61.30       51.90       43.50


           NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                    COEFFICIENTS FOR    NORFOLK             VIRGINIA
                      AND STATION LATITUDE  =  36.54 DEGREES




*******************************************************************************

           AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
```

```
                          JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                          -------  -------  -------  -------  -------  -------
 PRECIPITATION
 -------------
   TOTALS                   3.35     3.03     4.30     2.47     3.26     3.54
                            5.71     6.63     4.84     2.72     2.72     3.44

   STD. DEVIATIONS          1.90     1.27     1.56     1.16     1.43     1.86
                            2.55     2.73     2.85     1.50     1.51     1.61

 RUNOFF
 ------
   TOTALS                   0.000    0.000    0.000    0.000    0.000    0.000
                            0.000    0.000    0.000    0.000    0.000    0.000

   STD. DEVIATIONS          0.000    0.000    0.000    0.000    0.000    0.000
                            0.000    0.000    0.000    0.000    0.000    0.000

 EVAPOTRANSPIRATION
 ------------------
   TOTALS                   1.537    1.717    3.051    2.587    2.673    2.973
                            3.589    3.703    2.740    1.875    1.614    1.336

   STD. DEVIATIONS          0.242    0.318    0.347    0.966    0.902    1.483
                            1.246    1.162    1.100    0.804    0.457    0.237

 LATERAL DRAINAGE COLLECTED FROM LAYER  2
 ----------------------------------------
   TOTALS                   1.8145   1.2450   1.7492   0.4275   0.5250   0.5390
                            1.5639   2.7325   2.3888   1.0137   0.9035   1.6810

   STD. DEVIATIONS          1.7065   1.0983   1.4406   0.4923   0.7747   0.7149
                            1.7238   1.9508   1.9424   0.9937   1.1250   1.4515

 PERCOLATION/LEAKAGE THROUGH LAYER  4
 ------------------------------------
   TOTALS                   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                            0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

   STD. DEVIATIONS          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                            0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 DAILY AVERAGE HEAD ON TOP OF LAYER  3
 -------------------------------------
   AVERAGES                 0.0042   0.0031   0.0040   0.0010   0.0012   0.0013
                            0.0036   0.0063   0.0057   0.0023   0.0021   0.0039

   STD. DEVIATIONS          0.0039   0.0028   0.0033   0.0012   0.0018   0.0017
                            0.0040   0.0045   0.0046   0.0023   0.0027   0.0033

*******************************************************************************


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```

```
     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES            CU. FEET       PERCENT
                               --------------------  -------------   ---------
 PRECIPITATION                  46.00    (   6.750)     166981.2     100.00

 RUNOFF                          0.000   (  0.0000)         0.00       0.000

 EVAPOTRANSPIRATION             29.395   (  3.1280)     106702.52     63.901

 LATERAL DRAINAGE COLLECTED     16.58359 (  5.18439)     60198.445   36.05103
   FROM LAYER  2

 PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)        0.009     0.00001
   LAYER  4

 AVERAGE HEAD ON TOP             0.003 (    0.001)
   OF LAYER  3

 CHANGE IN WATER STORAGE         0.022   (  1.0714)        80.23       0.048

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                PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------    -------------
      PRECIPITATION                              6.50          23595.000

      RUNOFF                                     0.000             0.0000

      DRAINAGE COLLECTED FROM LAYER  2           4.08182       14817.02050

      PERCOLATION/LEAKAGE THROUGH LAYER  4       0.000000          0.00078

      AVERAGE HEAD ON TOP OF LAYER  3            0.290

      MAXIMUM HEAD ON TOP OF LAYER  3            0.564

      LOCATION OF MAXIMUM HEAD IN LAYER  2
            (DISTANCE FROM DRAIN)                7.5 FEET

      SNOW WATER                                 2.89          10491.8437


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.3980

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1360

       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.
```

```
*******************************************************************************




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                   FINAL WATER STORAGE AT END OF YEAR   30
    ----------------------------------------------------------------------
                    LAYER        (INCHES)       (VOL/VOL)
                    -----        --------       ---------
                      1           4.9429         0.2746

                      2           0.0073         0.0242

                      3           0.0000         0.0000

                      4           0.1500         0.7500

                  SNOW WATER      0.000

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**                                                                            **
**                                                                            **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                 **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                   USAE WATERWAYS EXPERIMENT STATION                        **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                **
**                                                                            **
**                                                                            **
********************************************************************************
********************************************************************************


PRECIPITATION DATA FILE:     H:\HELP307\SPSA7\SPSA7.D4
TEMPERATURE DATA FILE:       H:\HELP307\SPSA7\SPSA7.D7
SOLAR RADIATION DATA FILE:   H:\HELP307\SPSA7\SPSA7.D13
EVAPOTRANSPIRATION DATA:     H:\HELP307\SPSA7\SPSA7.D11
SOIL AND DESIGN DATA FILE:   H:\HELP307\SPSA7\SPSA71LT.D10
OUTPUT DATA FILE:            H:\HELP307\SPSA7\SPSA71LT.OUT


TIME:   8:24     DATE:   8/ 1/2008


********************************************************************************

     TITLE:  SPSA CELL 7 10' OF WASTE

********************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                    LAYER  1
                                    --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   7
           THICKNESS                   =      6.00   INCHES
           POROSITY                    =      0.4730 VOL/VOL
           FIELD CAPACITY              =      0.2220 VOL/VOL
           WILTING POINT               =      0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT  =      0.1602 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC


                                    LAYER  2
                                    --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
              MATERIAL TEXTURE NUMBER  18
THICKNESS                   =    120.00   INCHES
POROSITY                    =      0.6710 VOL/VOL
FIELD CAPACITY              =      0.2920 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3120 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =     18.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2677 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  4
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.30   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0149 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   26.2999992000     CM/SEC
SLOPE                       =      2.50   PERCENT
DRAINAGE LENGTH             =    265.0    FEET


                        LAYER  5
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      7.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  6
                        --------
```

```
                    TYPE 3 - BARRIER SOIL LINER
                    MATERIAL TEXTURE NUMBER   0
      THICKNESS                    =      0.20   INCHES
      POROSITY                     =      0.7500 VOL/VOL
      FIELD CAPACITY               =      0.7470 VOL/VOL
      WILTING POINT                =      0.4000 VOL/VOL
      INITIAL SOIL WATER CONTENT   =      0.7500 VOL/VOL
      EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC




              GENERAL DESIGN AND EVAPORATIVE ZONE DATA
              ----------------------------------------

    NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
             SOIL DATA BASE USING SOIL TEXTURE # 7 WITH BARE
             GROUND CONDITIONS, A SURFACE SLOPE OF  2.% AND
             A SLOPE LENGTH OF  265. FEET.

   SCS RUNOFF CURVE NUMBER              =     88.30
   FRACTION OF AREA ALLOWING RUNOFF     =      0.0    PERCENT
   AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
   EVAPORATIVE ZONE DEPTH               =     10.0    INCHES
   INITIAL WATER IN EVAPORATIVE ZONE    =      1.998  INCHES
   UPPER LIMIT OF EVAPORATIVE STORAGE   =      5.522  INCHES
   LOWER LIMIT OF EVAPORATIVE STORAGE   =      0.932  INCHES
   INITIAL SNOW WATER                   =      0.000  INCHES
   INITIAL WATER IN LAYER MATERIALS     =     43.373  INCHES
   TOTAL INITIAL WATER                  =     43.373  INCHES
   TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR



               EVAPOTRANSPIRATION AND WEATHER DATA
               -----------------------------------

    NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
             NORFOLK               VIRGINIA

        STATION LATITUDE                        =  36.54 DEGREES
        MAXIMUM LEAF AREA INDEX                 =   0.00
        START OF GROWING SEASON (JULIAN DATE)   =     91
        END OF GROWING SEASON (JULIAN DATE)     =    306
        EVAPORATIVE ZONE DEPTH                  =  10.0  INCHES
        AVERAGE ANNUAL WIND SPEED               =   7.60 MPH
        AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  68.00 %
        AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  68.00 %
        AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  77.00 %
        AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  73.00 %


    NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
             COEFFICIENTS FOR    NORFOLK             VIRGINIA

             NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
-------     -------     -------     -------     -------     -------
```

```
          3.72         3.28         3.86         2.87         3.75         3.45
          5.15         5.33         4.35         3.41         2.88         3.17


           NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                    COEFFICIENTS FOR    NORFOLK             VIRGINIA

               NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

        JAN/JUL      FEB/AUG      MAR/SEP      APR/OCT      MAY/NOV      JUN/DEC
        -------      -------      -------      -------      -------      -------
         39.90        41.10        48.50        58.20        66.40        74.30
         78.40        77.70        72.20        61.30        51.90        43.50


           NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                    COEFFICIENTS FOR    NORFOLK             VIRGINIA
                      AND STATION LATITUDE  =  36.54 DEGREES




*******************************************************************************

           AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------

                         JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                         -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS                 3.35     3.03     4.30     2.47     3.26     3.54
                           5.71     6.63     4.84     2.72     2.72     3.44

    STD. DEVIATIONS        1.90     1.27     1.56     1.16     1.43     1.86
                           2.55     2.73     2.85     1.50     1.51     1.61

  RUNOFF
  ------
    TOTALS                 0.000    0.000    0.000    0.000    0.000    0.000
                           0.000    0.000    0.000    0.000    0.000    0.000

    STD. DEVIATIONS        0.000    0.000    0.000    0.000    0.000    0.000
                           0.000    0.000    0.000    0.000    0.000    0.000

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                 1.587    1.759    3.137    2.877    2.826    3.141
                           3.795    4.067    3.042    2.047    1.679    1.363

    STD. DEVIATIONS        0.224    0.322    0.301    0.958    0.965    1.555
                           1.289    1.068    1.044    0.827    0.434    0.213

  LATERAL DRAINAGE COLLECTED FROM LAYER  4
  ----------------------------------------
    TOTALS                 1.6756   1.6191   1.5433   1.2970   0.4691   0.3698
                           0.4644   1.2253   2.1679   2.1004   0.9665   0.7991

    STD. DEVIATIONS        1.2984   1.2516   1.0760   0.9952   0.5161   0.5236
```

```
                         0.7375   1.1956   1.5817   1.6386   0.7687   0.8604

  PERCOLATION/LEAKAGE THROUGH LAYER  6
  ------------------------------------
    TOTALS               0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
              AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  5
  -------------------------------------
    AVERAGES             0.0038   0.0041   0.0035   0.0031   0.0011   0.0009
                         0.0011   0.0028   0.0051   0.0048   0.0023   0.0018

    STD. DEVIATIONS      0.0030   0.0032   0.0025   0.0024   0.0012   0.0012
                         0.0017   0.0027   0.0038   0.0038   0.0018   0.0020

*******************************************************************************


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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES           CU. FEET      PERCENT
                               -------------------  -------------  ---------
 PRECIPITATION                  46.00    (   6.750)    166981.2     100.00

 RUNOFF                          0.000   (  0.0000)         0.00      0.000

 EVAPOTRANSPIRATION             31.319   (  3.3166)    113688.77     68.085

 LATERAL DRAINAGE COLLECTED     14.69754 (  5.07395)    53352.082   31.95095
   FROM LAYER  4

 PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)        0.010     0.00001
   LAYER  6

 AVERAGE HEAD ON TOP             0.003 (    0.001)
   OF LAYER  5

 CHANGE IN WATER STORAGE        -0.016   (  2.5209)       -59.66     -0.036

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                PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ------------------------------------------------------------------------
                                                 (INCHES)      (CU. FT.)
                                                ----------   -------------
     PRECIPITATION                                 6.50        23595.000
```

```
    RUNOFF                                      0.000             0.0000

    DRAINAGE COLLECTED FROM LAYER  4            0.36743        1333.76672

    PERCOLATION/LEAKAGE THROUGH LAYER  6        0.000000          0.00009

    AVERAGE HEAD ON TOP OF LAYER  5             0.026

    MAXIMUM HEAD ON TOP OF LAYER  5             0.053

    LOCATION OF MAXIMUM HEAD IN LAYER  4
          (DISTANCE FROM DRAIN)                 0.0 FEET

    SNOW WATER                                  2.89          10491.8437


    MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.5522

    MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.0932

     ***  Maximum heads are computed using McEnroe's equations.  ***

          Reference:  Maximum Saturated Depth over Landfill Liner
                      by Bruce M. McEnroe, University of Kansas
                      ASCE Journal of Environmental Engineering
                      Vol. 119, No. 2, March 1993, pp. 262-270.

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                   FINAL WATER STORAGE AT END OF YEAR   30
    ----------------------------------------------------------------------
                    LAYER        (INCHES)       (VOL/VOL)
                    -----        --------       ---------
                      1            1.4390         0.2398

                      2           36.5465         0.3046

                      3            4.7412         0.2634

                      4            0.0030         0.0100

                      5            0.0000         0.0000

                      6            0.1500         0.7500

                  SNOW WATER       0.000

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**                                                                          **
**                                                                          **
**                HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE             **
**                  HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)              **
**                    DEVELOPED BY ENVIRONMENTAL LABORATORY                 **
**                      USAE WATERWAYS EXPERIMENT STATION                   **
**               FOR USEPA RISK REDUCTION ENGINEERING LABORATORY            **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    H:\HELP307\SPSA7\SPSA1TRY.D4
TEMPERATURE DATA FILE:      H:\HELP307\SPSA7\SPSA7.D7
SOLAR RADIATION DATA FILE:  H:\HELP307\SPSA7\SPSA7.D13
EVAPOTRANSPIRATION DATA:    H:\HELP307\SPSA7\SPSA7.D11
SOIL AND DESIGN DATA FILE:  H:\HELP307\SPSA7\SPSA7REC.D10
OUTPUT DATA FILE:           H:\HELP307\SPSA7\SPSA7REC.OUT


TIME:   8:34     DATE:   8/ 1/2008


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     TITLE:  SPSA CELL 7 20' OF WASTE 100% RECICULATION W/ DESIGN STORM

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   7
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.4730 VOL/VOL
           FIELD CAPACITY             =      0.2220 VOL/VOL
           WILTING POINT              =      0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.2486 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.520000001000E-03 CM/SEC
         NOTE:  100.00 PERCENT OF THE DRAINAGE COLLECTED FROM LAYER # 4
                  IS RECIRCULATED INTO THIS LAYER.


                                   LAYER  2
                                   --------
```

```
              TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER  18
    THICKNESS                   =   240.00   INCHES
    POROSITY                    =     0.6710 VOL/VOL
    FIELD CAPACITY              =     0.2920 VOL/VOL
    WILTING POINT               =     0.0770 VOL/VOL
    INITIAL SOIL WATER CONTENT  =     0.3461 VOL/VOL
    EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                          LAYER  3
                          --------

               TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER  10
    THICKNESS                   =    18.00   INCHES
    POROSITY                    =     0.3980 VOL/VOL
    FIELD CAPACITY              =     0.2440 VOL/VOL
    WILTING POINT               =     0.1360 VOL/VOL
    INITIAL SOIL WATER CONTENT  =     0.3306 VOL/VOL
    EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                          LAYER  4
                          --------

               TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER   0
    THICKNESS                   =     0.30   INCHES
    POROSITY                    =     0.8500 VOL/VOL
    FIELD CAPACITY              =     0.0100 VOL/VOL
    WILTING POINT               =     0.0050 VOL/VOL
    INITIAL SOIL WATER CONTENT  =     0.0664 VOL/VOL
    EFFECTIVE SAT. HYD. COND.   =   26.2999992000     CM/SEC
    SLOPE                       =     2.50   PERCENT
    DRAINAGE LENGTH             =    265.0    FEET
  NOTE:  100.00 PERCENT OF THE DRAINAGE COLLECTED FROM THIS
           LAYER IS RECIRCULATED INTO LAYER #  1.


                          LAYER  5
                          --------

               TYPE 4 - FLEXIBLE MEMBRANE LINER
                MATERIAL TEXTURE NUMBER  35
    THICKNESS                   =     0.06   INCHES
    POROSITY                    =     0.0000 VOL/VOL
    FIELD CAPACITY              =     0.0000 VOL/VOL
    WILTING POINT               =     0.0000 VOL/VOL
    INITIAL SOIL WATER CONTENT  =     0.0000 VOL/VOL
    EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
    FML PINHOLE DENSITY         =     1.00   HOLES/ACRE
    FML INSTALLATION DEFECTS    =     7.00   HOLES/ACRE
    FML PLACEMENT QUALITY       =  3 - GOOD
```

```
                           LAYER  6
                           --------

                 TYPE 3 - BARRIER SOIL LINER
                 MATERIAL TEXTURE NUMBER   0
   THICKNESS                   =      0.20   INCHES
   POROSITY                    =      0.7500 VOL/VOL
   FIELD CAPACITY              =      0.7470 VOL/VOL
   WILTING POINT               =      0.4000 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =  0.499999997000E-08 CM/SEC




           GENERAL DESIGN AND EVAPORATIVE ZONE DATA
           ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 7 WITH BARE
          GROUND CONDITIONS, A SURFACE SLOPE OF  2.% AND
          A SLOPE LENGTH OF  265. FEET.

SCS RUNOFF CURVE NUMBER             =     88.30
FRACTION OF AREA ALLOWING RUNOFF    =      0.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      2.629  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      5.522  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      0.932  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =     90.665  INCHES
TOTAL INITIAL WATER                 =     90.665  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR



            EVAPOTRANSPIRATION AND WEATHER DATA
            -----------------------------------

 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          NORFOLK               VIRGINIA

     STATION LATITUDE                       =  36.54 DEGREES
     MAXIMUM LEAF AREA INDEX                =   0.00
     START OF GROWING SEASON (JULIAN DATE)  =     91
     END OF GROWING SEASON (JULIAN DATE)    =    306
     EVAPORATIVE ZONE DEPTH                 =  10.0  INCHES
     AVERAGE ANNUAL WIND SPEED              =   7.60 MPH
     AVERAGE 1ST QUARTER RELATIVE HUMIDITY  =  68.00 %
     AVERAGE 2ND QUARTER RELATIVE HUMIDITY  =  68.00 %
     AVERAGE 3RD QUARTER RELATIVE HUMIDITY  =  77.00 %
     AVERAGE 4TH QUARTER RELATIVE HUMIDITY  =  73.00 %


 NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
          COEFFICIENTS FOR    NORFOLK             VIRGINIA
```

```
                   NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

      JAN/JUL      FEB/AUG      MAR/SEP      APR/OCT      MAY/NOV      JUN/DEC
      -------      -------      -------      -------      -------      -------
        3.72         3.28         3.86         2.87         3.75         3.45
        5.15         5.33         4.35         3.41         2.88         3.17


          NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                 COEFFICIENTS FOR    NORFOLK             VIRGINIA

              NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

      JAN/JUL      FEB/AUG      MAR/SEP      APR/OCT      MAY/NOV      JUN/DEC
      -------      -------      -------      -------      -------      -------
       39.90        41.10        48.50        58.20        66.40        74.30
       78.40        77.70        72.20        61.30        51.90        43.50


          NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                 COEFFICIENTS FOR    NORFOLK             VIRGINIA
                   AND STATION LATITUDE  =  36.54 DEGREES




*******************************************************************************

         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH    1
-------------------------------------------------------------------------------

                         JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                         -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS                 2.04     2.88     4.22     1.11     1.80     5.17
                           5.99    11.43     4.40     4.46     1.36     4.39

    STD. DEVIATIONS        0.00     0.00     0.00     0.00     0.00     0.00
                           0.00     0.00     0.00     0.00     0.00     0.00

  RUNOFF
  ------
    TOTALS                 0.000    0.000    0.000    0.000    0.000    0.000
                           0.000    0.000    0.000    0.000    0.000    0.000

    STD. DEVIATIONS        0.000    0.000    0.000    0.000    0.000    0.000
                           0.000    0.000    0.000    0.000    0.000    0.000

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                 1.763    2.104    3.085    1.853    1.869    5.027
                           4.398    4.862    3.119    3.080    1.563    1.510

    STD. DEVIATIONS        0.000    0.000    0.000    0.000    0.000    0.000
                           0.000    0.000    0.000    0.000    0.000    0.000

  LATERAL DRAINAGE RECIRCULATED INTO LAYER  1
  -------------------------------------------
```

```
   TOTALS                  6.8451   5.1470   6.3799   7.0898   6.6129   7.1735
                           7.3814   8.2119  11.7954  17.0312  16.4651  18.4024

   STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

 LATERAL DRAINAGE COLLECTED FROM LAYER  4
 ----------------------------------------
   TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

   STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

 LATERAL DRAINAGE RECIRCULATED FROM LAYER  4
 -------------------------------------------
   TOTALS                  6.8451   5.1470   6.3799   7.0898   6.6129   7.1735
                           7.3814   8.2119  11.7954  17.0312  16.4651  18.4024

   STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

 PERCOLATION/LEAKAGE THROUGH LAYER  6
 ------------------------------------
   TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

   STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 DAILY AVERAGE HEAD ON TOP OF LAYER  5
 -------------------------------------
   AVERAGES                0.0157   0.0131   0.0146   0.0168   0.0152   0.0170
                           0.0169   0.0188   0.0280   0.0391   0.0390   0.0422

   STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

*******************************************************************************


*******************************************************************************

    AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH    1
-------------------------------------------------------------------------------
                                INCHES           CU. FEET      PERCENT
                          -------------------  -------------   ---------
 PRECIPITATION              49.25    (   0.000)    178777.5     100.00

 RUNOFF                      0.000   (  0.0000)         0.00      0.000

 EVAPOTRANSPIRATION         34.234   (  0.0000)    124269.24     69.511

 DRAINAGE RECIRCULATED     118.53563 (  0.00000)   430284.344  240.68149
   INTO LAYER  1
```

```
 LATERAL DRAINAGE COLLECTED      0.00000 (  0.00000)         0.000    0.00000
   FROM LAYER  4

 DRAINAGE RECIRCULATED         118.53563 (  0.00000)    430284.344  240.68149
   FROM LAYER  4

 PERCOLATION/LEAKAGE THROUGH     0.00001 (  0.00000)         0.030     0.00002
   LAYER  6

 AVERAGE HEAD ON TOP             0.023 (    0.000)
   OF LAYER  5

 CHANGE IN WATER STORAGE        14.652   (  0.0000)      53185.13     29.749
*******************************************************************************


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                PEAK DAILY VALUES FOR YEARS    1 THROUGH    1
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------    -------------
      PRECIPITATION                              6.50          23595.000

      RUNOFF                                     0.000             0.0000

      DRAINAGE RECIRCULATED INTO LAYER  1        1.13977        4137.36719

      DRAINAGE COLLECTED FROM LAYER  4           0.00000           0.00000

      DRAINAGE RECIRCULATED FROM LAYER  4        1.13977        4137.36719

      PERCOLATION/LEAKAGE THROUGH LAYER  6       0.000000          0.00022

      AVERAGE HEAD ON TOP OF LAYER  5            0.081

      MAXIMUM HEAD ON TOP OF LAYER  5            0.160

      LOCATION OF MAXIMUM HEAD IN LAYER  4
            (DISTANCE FROM DRAIN)                2.9 FEET

      SNOW WATER                                 0.56           2033.9432


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.5451

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.2330


       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.


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```

```
0
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                   FINAL WATER STORAGE AT END OF YEAR    1
    ----------------------------------------------------------------------
                    LAYER        (INCHES)       (VOL/VOL)
                    -----        --------       ---------
                      1            2.0396         0.3399

                      2           97.0675         0.4044

                      3            6.0282         0.3349

                      4            0.0312         0.1040

                      5            0.0000         0.0000

                      6            0.1500         0.7500

                  SNOW WATER       0.000

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:    H:\HELP307\SPSA7\SPSA7.D4
TEMPERATURE DATA FILE:      H:\HELP307\SPSA7\SPSA7.D7
SOLAR RADIATION DATA FILE:  H:\HELP307\SPSA7\SPSA7.D13
EVAPOTRANSPIRATION DATA:    H:\HELP307\SPSA7\SPSA7.D11
SOIL AND DESIGN DATA FILE:  H:\HELP307\SPSA7\SPSA7PAC.D10
OUTPUT DATA FILE:           H:\HELP307\SPSA7\SPSA7PAC.OUT



TIME:   9: 5     DATE:   8/ 1/2008



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     TITLE:  SPSA CELL 7 Intermediate Cover Top @ 170'

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   7
           THICKNESS                  =     12.00   INCHES
           POROSITY                   =      0.4730 VOL/VOL
           FIELD CAPACITY             =      0.2220 VOL/VOL
           WILTING POINT              =      0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.1990 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.520000001000E-03 CM/SEC



                                   LAYER  2
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
              MATERIAL TEXTURE NUMBER  18
THICKNESS                    =   2280.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2931 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC



                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                    =     18.00   INCHES
POROSITY                     =      0.3980 VOL/VOL
FIELD CAPACITY               =      0.2440 VOL/VOL
WILTING POINT                =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2612 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC



                        LAYER  4
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.24   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0109 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   2.17000008000     CM/SEC
SLOPE                        =      2.50   PERCENT
DRAINAGE LENGTH              =    265.0    FEET



                        LAYER  5
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      7.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD



                        LAYER  6
                        --------
```

```
                  TYPE 3 - BARRIER SOIL LINER
                  MATERIAL TEXTURE NUMBER   0
    THICKNESS                     =      0.20   INCHES
    POROSITY                      =      0.7500 VOL/VOL
    FIELD CAPACITY                =      0.7470 VOL/VOL
    WILTING POINT                 =      0.4000 VOL/VOL
    INITIAL SOIL WATER CONTENT    =      0.7500 VOL/VOL
    EFFECTIVE SAT. HYD. COND.     =  0.499999997000E-08 CM/SEC




            GENERAL DESIGN AND EVAPORATIVE ZONE DATA
            ----------------------------------------

     NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
              SOIL DATA BASE USING SOIL TEXTURE # 7 WITH BARE
              GROUND CONDITIONS, A SURFACE SLOPE OF 33.% AND
              A SLOPE LENGTH OF  360. FEET.

   SCS RUNOFF CURVE NUMBER              =     88.90
   FRACTION OF AREA ALLOWING RUNOFF     =     80.0    PERCENT
   AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
   EVAPORATIVE ZONE DEPTH               =     10.0    INCHES
   INITIAL WATER IN EVAPORATIVE ZONE    =      1.861  INCHES
   UPPER LIMIT OF EVAPORATIVE STORAGE   =      4.730  INCHES
   LOWER LIMIT OF EVAPORATIVE STORAGE   =      1.040  INCHES
   INITIAL SNOW WATER                   =      0.000  INCHES
   INITIAL WATER IN LAYER MATERIALS     =    675.608  INCHES
   TOTAL INITIAL WATER                  =    675.608  INCHES
   TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR



             EVAPOTRANSPIRATION AND WEATHER DATA
             -----------------------------------

     NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
              NORFOLK               VIRGINIA

        STATION LATITUDE                        =  36.54 DEGREES
        MAXIMUM LEAF AREA INDEX                 =   0.00
        START OF GROWING SEASON (JULIAN DATE)   =     91
        END OF GROWING SEASON (JULIAN DATE)     =    306
        EVAPORATIVE ZONE DEPTH                  =  10.0  INCHES
        AVERAGE ANNUAL WIND SPEED               =   7.60 MPH
        AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  68.00 %
        AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  68.00 %
        AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  77.00 %
        AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  73.00 %


     NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
              COEFFICIENTS FOR    NORFOLK             VIRGINIA

              NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

  JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
  -------     -------     -------     -------     -------     -------
```

```
       3.72        3.28        3.86        2.87        3.75        3.45
       5.15        5.33        4.35        3.41        2.88        3.17


         NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA

             NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
      39.90       41.10       48.50       58.20       66.40       74.30
      78.40       77.70       72.20       61.30       51.90       43.50


         NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA
                    AND STATION LATITUDE  =  36.54 DEGREES



*******************************************************************************

         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------

                         JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                         -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS                 3.35     3.03     4.30     2.47     3.26     3.54
                           5.71     6.63     4.84     2.72     2.72     3.44

    STD. DEVIATIONS        1.90     1.27     1.56     1.16     1.43     1.86
                           2.55     2.73     2.85     1.50     1.51     1.61

  RUNOFF
  ------
    TOTALS                 0.168    0.100    0.293    0.057    0.172    0.183
                           0.575    0.951    0.875    0.178    0.138    0.200

    STD. DEVIATIONS        0.258    0.118    0.550    0.119    0.246    0.217
                           0.676    0.724    1.085    0.229    0.213    0.219

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                 1.556    1.737    3.092    2.693    2.705    3.030
                           3.681    3.781    2.819    1.931    1.633    1.344

    STD. DEVIATIONS        0.231    0.315    0.324    0.988    0.913    1.505
                           1.258    1.136    1.094    0.822    0.464    0.232

  LATERAL DRAINAGE COLLECTED FROM LAYER  4
  ----------------------------------------
    TOTALS                 0.9076   1.1625   1.3074   1.4696   0.9466   0.5804
                           0.4372   0.7697   1.1089   1.5095   1.1953   0.7309

    STD. DEVIATIONS        0.6737   0.6356   0.6809   0.9010   1.0195   0.7266
```

```
                           0.6266   0.5822   0.6321   0.8872   0.8087   0.5696

  PERCOLATION/LEAKAGE THROUGH LAYER  6
  ------------------------------------
    TOTALS                 0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS        0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  5
  -------------------------------------
    AVERAGES               0.0252   0.0355   0.0364   0.0422   0.0263   0.0167
                           0.0122   0.0214   0.0319   0.0420   0.0344   0.0203

    STD. DEVIATIONS        0.0187   0.0195   0.0189   0.0259   0.0284   0.0209
                           0.0174   0.0162   0.0182   0.0247   0.0232   0.0158

*******************************************************************************


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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES            CU. FEET       PERCENT
                               -------------------   -------------   ---------
 PRECIPITATION                  46.00    (   6.750)     166981.2     100.00

 RUNOFF                          3.889   (  1.7611)      14116.48      8.454

 EVAPOTRANSPIRATION             30.003   (  3.1939)     108910.06     65.223

 LATERAL DRAINAGE COLLECTED     12.12560 (  4.04383)     44015.922   26.35981
   FROM LAYER  4

 PERCOLATION/LEAKAGE THROUGH     0.00001 (  0.00000)         0.034     0.00002
   LAYER  6

 AVERAGE HEAD ON TOP             0.029 (    0.010)
   OF LAYER  5

 CHANGE IN WATER STORAGE        -0.017   (  3.1046)        -61.28     -0.037
*******************************************************************************


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                PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              6.50         23595.000
```

```
      RUNOFF                                     3.525        12797.3545

      DRAINAGE COLLECTED FROM LAYER  4           0.16481        598.24719

      PERCOLATION/LEAKAGE THROUGH LAYER  6       0.000000         0.00038

      AVERAGE HEAD ON TOP OF LAYER  5            0.142

      MAXIMUM HEAD ON TOP OF LAYER  5            0.279

      LOCATION OF MAXIMUM HEAD IN LAYER  4
            (DISTANCE FROM DRAIN)                4.2 FEET

      SNOW WATER                                 2.89         10491.8437


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.4579

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1040

       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.

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                   FINAL WATER STORAGE AT END OF YEAR   30
    ----------------------------------------------------------------------
                    LAYER        (INCHES)       (VOL/VOL)
                    -----        --------       ---------
                      1            3.0111         0.2509

                      2          667.1577         0.2926

                      3            4.7647         0.2647

                      4            0.0179         0.0746

                      5            0.0000         0.0000

                      6            0.1500         0.7500

                  SNOW WATER       0.000

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**                                                                           **
**                                                                           **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                    USAE WATERWAYS EXPERIMENT STATION                      **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                           **
**                                                                           **
*******************************************************************************
*******************************************************************************


PRECIPITATION DATA FILE:    H:\HELP307\SPSA7\SPSA7.D4
TEMPERATURE DATA FILE:      H:\HELP307\SPSA7\SPSA7.D7
SOLAR RADIATION DATA FILE:  H:\HELP307\SPSA7\SPSA7.D13
EVAPOTRANSPIRATION DATA:    H:\HELP307\SPSA7\SPSA7.D11
SOIL AND DESIGN DATA FILE:  H:\HELP307\SPSA7\SPSA7PCR.D10
OUTPUT DATA FILE:           H:\HELP307\SPSA7\SPSA7PCR.OUT


TIME:  11:58     DATE:   8/ 1/2008


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     TITLE:  SPSA CELL 7 Intermediate Cover Top @ 170' w 100% Recirc

*******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   7
           THICKNESS                   =    12.00   INCHES
           POROSITY                    =     0.4730 VOL/VOL
           FIELD CAPACITY              =     0.2220 VOL/VOL
           WILTING POINT               =     0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT  =     0.1990 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC


                                  LAYER  2
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
                MATERIAL TEXTURE NUMBER  18
  THICKNESS                    =  2280.00   INCHES
  POROSITY                     =     0.6710 VOL/VOL
  FIELD CAPACITY               =     0.2920 VOL/VOL
  WILTING POINT                =     0.0770 VOL/VOL
  INITIAL SOIL WATER CONTENT   =     0.2961 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    = 0.100000005000E-02 CM/SEC
NOTE:  100.00 PERCENT OF THE DRAINAGE COLLECTED FROM LAYER # 4
         IS RECIRCULATED INTO THIS LAYER.



                          LAYER  3
                          --------

              TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER  10
  THICKNESS                    =    18.00   INCHES
  POROSITY                     =     0.3980 VOL/VOL
  FIELD CAPACITY               =     0.2440 VOL/VOL
  WILTING POINT                =     0.1360 VOL/VOL
  INITIAL SOIL WATER CONTENT   =     0.2654 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    = 0.119999997000E-03 CM/SEC



                          LAYER  4
                          --------

              TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER   0
  THICKNESS                    =     0.24   INCHES
  POROSITY                     =     0.8500 VOL/VOL
  FIELD CAPACITY               =     0.0100 VOL/VOL
  WILTING POINT                =     0.0050 VOL/VOL
  INITIAL SOIL WATER CONTENT   =     0.0194 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    =  2.17000008000     CM/SEC
  SLOPE                        =     2.50   PERCENT
  DRAINAGE LENGTH              =   265.0    FEET
NOTE:  100.00 PERCENT OF THE DRAINAGE COLLECTED FROM THIS
         LAYER IS RECIRCULATED INTO LAYER #  2.



                          LAYER  5
                          --------

              TYPE 4 - FLEXIBLE MEMBRANE LINER
                MATERIAL TEXTURE NUMBER  35
  THICKNESS                    =     0.06   INCHES
  POROSITY                     =     0.0000 VOL/VOL
  FIELD CAPACITY               =     0.0000 VOL/VOL
  WILTING POINT                =     0.0000 VOL/VOL
  INITIAL SOIL WATER CONTENT   =     0.0000 VOL/VOL
  EFFECTIVE SAT. HYD. COND.    = 0.199999996000E-12 CM/SEC
  FML PINHOLE DENSITY          =     1.00   HOLES/ACRE
  FML INSTALLATION DEFECTS     =     7.00   HOLES/ACRE
  FML PLACEMENT QUALITY        = 3 - GOOD
```

```
                           LAYER  6
                           --------

                 TYPE 3 - BARRIER SOIL LINER
                 MATERIAL TEXTURE NUMBER   0
   THICKNESS                      =     0.20   INCHES
   POROSITY                       =     0.7500 VOL/VOL
   FIELD CAPACITY                 =     0.7470 VOL/VOL
   WILTING POINT                  =     0.4000 VOL/VOL
   INITIAL SOIL WATER CONTENT     =     0.7500 VOL/VOL
   EFFECTIVE SAT. HYD. COND.      =  0.499999997000E-08 CM/SEC




           GENERAL DESIGN AND EVAPORATIVE ZONE DATA
           ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 7 WITH BARE
          GROUND CONDITIONS, A SURFACE SLOPE OF 33.% AND
          A SLOPE LENGTH OF  360. FEET.

SCS RUNOFF CURVE NUMBER             =     88.90
FRACTION OF AREA ALLOWING RUNOFF    =     80.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      1.861  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      4.730  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.040  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =    682.370  INCHES
TOTAL INITIAL WATER                 =    682.370  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR



            EVAPOTRANSPIRATION AND WEATHER DATA
            ----------------------------------

 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          NORFOLK               VIRGINIA

     STATION LATITUDE                        =  36.54 DEGREES
     MAXIMUM LEAF AREA INDEX                 =   0.00
     START OF GROWING SEASON (JULIAN DATE)   =     91
     END OF GROWING SEASON (JULIAN DATE)     =    306
     EVAPORATIVE ZONE DEPTH                  =  10.0  INCHES
     AVERAGE ANNUAL WIND SPEED               =   7.60 MPH
     AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  68.00 %
     AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  68.00 %
     AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  77.00 %
     AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  73.00 %


 NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
          COEFFICIENTS FOR    NORFOLK             VIRGINIA
```

```
                 NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
       3.72        3.28        3.86        2.87        3.75        3.45
       5.15        5.33        4.35        3.41        2.88        3.17


         NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA

             NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
      39.90       41.10       48.50       58.20       66.40       74.30
      78.40       77.70       72.20       61.30       51.90       43.50


         NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA
                    AND STATION LATITUDE  =  36.54 DEGREES




*******************************************************************************

         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH    6
-------------------------------------------------------------------------------

                          JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                          -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS                  4.26     3.07     4.22     2.43     3.54     5.40
                            6.46     6.93     5.41     2.65     2.15     3.17

    STD. DEVIATIONS         2.29     1.02     1.70     1.13     2.12     1.75
                            3.46     2.16     3.57     1.22     1.21     1.52

  RUNOFF
  ------
    TOTALS                  0.294    0.106    0.256    0.023    0.324    0.195
                            0.764    0.971    1.483    0.070    0.078    0.145

    STD. DEVIATIONS         0.324    0.116    0.486    0.047    0.438    0.189
                            1.116    0.586    1.800    0.050    0.188    0.115

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                  1.391    1.900    2.938    2.697    2.536    4.505
                            4.123    4.346    3.024    2.160    1.622    1.210

    STD. DEVIATIONS         0.199    0.288    0.175    0.825    1.139    1.040
                            1.121    0.910    0.923    0.602    0.534    0.327

  LATERAL DRAINAGE RECIRCULATED INTO LAYER  2
  -------------------------------------------
```

```
  TOTALS                  2.0433   1.8511   2.3257   2.3824   2.4267   2.5236
                          2.5738   2.1879   2.6310   2.3192   2.9476   2.7501

  STD. DEVIATIONS         1.0232   0.4675   0.8640   0.7825   0.7753   0.8932
                          0.6932   0.7821   0.5269   0.9130   0.6532   0.9636

 LATERAL DRAINAGE COLLECTED FROM LAYER  4
 ----------------------------------------
  TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

 LATERAL DRAINAGE RECIRCULATED FROM LAYER  4
 -------------------------------------------
  TOTALS                  2.0433   1.8511   2.3257   2.3824   2.4267   2.5236
                          2.5738   2.1879   2.6310   2.3192   2.9476   2.7501

  STD. DEVIATIONS         1.0232   0.4675   0.8640   0.7825   0.7753   0.8932
                          0.6932   0.7821   0.5269   0.9130   0.6532   0.9636

 PERCOLATION/LEAKAGE THROUGH LAYER  6
 ------------------------------------
  TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


 DAILY AVERAGE HEAD ON TOP OF LAYER  5
 -------------------------------------
  AVERAGES                0.0568   0.0567   0.0647   0.0685   0.0675   0.0725
                          0.0716   0.0609   0.0756   0.0645   0.0847   0.0765

  STD. DEVIATIONS         0.0285   0.0144   0.0240   0.0225   0.0216   0.0257
                          0.0193   0.0218   0.0151   0.0254   0.0188   0.0268

*******************************************************************************


*******************************************************************************

    AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH    6
-------------------------------------------------------------------------------
                                   INCHES           CU. FEET       PERCENT
                               -------------------  -------------  ---------
 PRECIPITATION                  49.71    (   8.700)    180435.2     100.00

 RUNOFF                          4.711   (  3.0880)     17101.47      9.478

 EVAPOTRANSPIRATION             32.452   (  1.3602)    117801.12     65.287

 DRAINAGE RECIRCULATED          28.96229 (  8.78153)   105133.109   58.26641
   INTO LAYER  2
```

```
 LATERAL DRAINAGE COLLECTED      0.00000 (  0.00000)         0.000    0.00000
   FROM LAYER  4

 DRAINAGE RECIRCULATED          28.96229 (  8.78153)    105133.109   58.26641
   FROM LAYER  4

 PERCOLATION/LEAKAGE THROUGH     0.00002 (  0.00001)         0.071     0.00004
   LAYER  6

 AVERAGE HEAD ON TOP             0.068 (    0.021)
   OF LAYER  5

 CHANGE IN WATER STORAGE        12.527   (  5.1422)      45471.60     25.201

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               PEAK DAILY VALUES FOR YEARS    1 THROUGH    6
   ------------------------------------------------------------------------
                                                 (INCHES)      (CU. FT.)
                                               ----------    -------------
      PRECIPITATION                                6.50        23595.000

      RUNOFF                                       3.525       12797.3545

      DRAINAGE RECIRCULATED INTO LAYER  2          0.26364       957.01965

      DRAINAGE COLLECTED FROM LAYER  4             0.00000         0.00000

      DRAINAGE RECIRCULATED FROM LAYER  4          0.26364       957.01965

      PERCOLATION/LEAKAGE THROUGH LAYER  6         0.000000        0.00061

      AVERAGE HEAD ON TOP OF LAYER  5              0.227

      MAXIMUM HEAD ON TOP OF LAYER  5              0.444

      LOCATION OF MAXIMUM HEAD IN LAYER  4
            (DISTANCE FROM DRAIN)                  6.2 FEET

      SNOW WATER                                   2.50         9058.6426


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                   0.4579

      MINIMUM VEG. SOIL WATER (VOL/VOL)                   0.1040


       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.

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           FINAL WATER STORAGE AT END OF YEAR    6
    ----------------------------------------------------------------------
                   LAYER        (INCHES)       (VOL/VOL)
                   -----        --------       ---------
                     1            3.5029         0.2919

                     2          748.6008         0.3283

                     3            5.2062         0.2892

                     4            0.0698         0.2907

                     5            0.0000         0.0000

                     6            0.1500         0.7500

                  SNOW WATER      0.000

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**                                                                           **
**                                                                           **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                    USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                           **
**                                                                           **
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PRECIPITATION DATA FILE:    H:\HELP307\SPSA7\SPSA7.D4
TEMPERATURE DATA FILE:      H:\HELP307\SPSA7\SPSA7.D7
SOLAR RADIATION DATA FILE:  H:\HELP307\SPSA7\SPSA7.D13
EVAPOTRANSPIRATION DATA:    H:\HELP307\SPSA7\SPSA7.D11
SOIL AND DESIGN DATA FILE:  H:\HELP307\SPSA7\SPSA7CLO.D10
OUTPUT DATA FILE:           H:\HELP307\SPSA7\SPSA7C~1.OUT



TIME:  12: 1     DATE:   8/ 1/2008



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     TITLE:  SPSA CELL 7 Closed Landfill

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.



                                  LAYER  1
                                  --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER   7
           THICKNESS                    =      6.00   INCHES
           POROSITY                     =      0.4730 VOL/VOL
           FIELD CAPACITY               =      0.2220 VOL/VOL
           WILTING POINT                =      0.1040 VOL/VOL
           INITIAL SOIL WATER CONTENT   =      0.1611 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.520000001000E-03 CM/SEC



                                  LAYER  2
                                  --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
```

```
              MATERIAL TEXTURE NUMBER   7
THICKNESS                   =     18.00   INCHES
POROSITY                    =      0.4730 VOL/VOL
FIELD CAPACITY              =      0.2220 VOL/VOL
WILTING POINT               =      0.1040 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2715 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.29   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0116 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   9.19999981000     CM/SEC
SLOPE                       =     33.00   PERCENT
DRAINAGE LENGTH             =    146.5    FEET


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                   =      0.04   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      7.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  5
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =     18.00   INCHES
POROSITY                    =      0.4190 VOL/VOL
FIELD CAPACITY              =      0.3070 VOL/VOL
WILTING POINT               =      0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  6
                        --------
```

```
          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   7
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.4730 VOL/VOL
FIELD CAPACITY              =      0.2220 VOL/VOL
WILTING POINT               =      0.1040 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2220 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                   =   2496.00   INCHES
POROSITY                    =      0.6710 VOL/VOL
FIELD CAPACITY              =      0.2920 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  8
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =     18.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  9
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.27   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   2.17000008000     CM/SEC
SLOPE                       =      2.50   PERCENT
DRAINAGE LENGTH             =    265.0    FEET


                        LAYER 10
                        --------
```

```
               TYPE 4 - FLEXIBLE MEMBRANE LINER
                 MATERIAL TEXTURE NUMBER  35
   THICKNESS                   =      0.06   INCHES
   POROSITY                    =      0.0000 VOL/VOL
   FIELD CAPACITY              =      0.0000 VOL/VOL
   WILTING POINT               =      0.0000 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
   FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
   FML INSTALLATION DEFECTS    =      7.00   HOLES/ACRE
   FML PLACEMENT QUALITY       =  3 - GOOD


                         LAYER 11
                         --------

                 TYPE 3 - BARRIER SOIL LINER
                 MATERIAL TEXTURE NUMBER   0
   THICKNESS                   =      0.20   INCHES
   POROSITY                    =      0.7500 VOL/VOL
   FIELD CAPACITY              =      0.7470 VOL/VOL
   WILTING POINT               =      0.4000 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.7500 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =  0.499999997000E-08 CM/SEC



           GENERAL DESIGN AND EVAPORATIVE ZONE DATA
           ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A
          FAIR STAND OF GRASS, A SURFACE SLOPE OF 33.%
          AND A SLOPE LENGTH OF  450. FEET.

SCS RUNOFF CURVE NUMBER            =     75.90
FRACTION OF AREA ALLOWING RUNOFF   =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE =      1.000  ACRES
EVAPORATIVE ZONE DEPTH             =     10.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE  =      1.935  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE =      4.730  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE =      1.040  INCHES
INITIAL SNOW WATER                 =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS   =    748.108  INCHES
TOTAL INITIAL WATER                =    748.108  INCHES
TOTAL SUBSURFACE INFLOW            =      0.00   INCHES/YEAR



            EVAPOTRANSPIRATION AND WEATHER DATA
            -----------------------------------

 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          NORFOLK              VIRGINIA

     STATION LATITUDE                        =  36.54 DEGREES
     MAXIMUM LEAF AREA INDEX                 =   0.00
     START OF GROWING SEASON (JULIAN DATE)   =     91
```

```
             END OF GROWING SEASON (JULIAN DATE)    =    306
             EVAPORATIVE ZONE DEPTH                 =  10.0  INCHES
             AVERAGE ANNUAL WIND SPEED              =   7.60 MPH
             AVERAGE 1ST QUARTER RELATIVE HUMIDITY  =  68.00 %
             AVERAGE 2ND QUARTER RELATIVE HUMIDITY  =  68.00 %
             AVERAGE 3RD QUARTER RELATIVE HUMIDITY  =  77.00 %
             AVERAGE 4TH QUARTER RELATIVE HUMIDITY  =  73.00 %


         NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA

                  NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
       3.72        3.28        3.86        2.87        3.75        3.45
       5.15        5.33        4.35        3.41        2.88        3.17


         NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA

             NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
      39.90       41.10       48.50       58.20       66.40       74.30
      78.40       77.70       72.20       61.30       51.90       43.50


         NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    NORFOLK             VIRGINIA
                    AND STATION LATITUDE  =  36.54 DEGREES




*******************************************************************************

         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------

                         JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                         -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS                 3.35     3.03     4.30     2.47     3.26     3.54
                           5.71     6.63     4.84     2.72     2.72     3.44

    STD. DEVIATIONS        1.90     1.27     1.56     1.16     1.43     1.86
                           2.55     2.73     2.85     1.50     1.51     1.61

  RUNOFF
  ------
    TOTALS                 0.023    0.005    0.128    0.002    0.017    0.022
                           0.132    0.284    0.342    0.021    0.023    0.030
```

```
    STD. DEVIATIONS          0.043    0.014    0.460    0.007    0.046    0.054
                             0.281    0.365    0.681    0.063    0.069    0.070

  EVAPOTRANSPIRATION
  ------------------
    TOTALS                   1.554    1.735    3.097    2.681    2.710    3.027
                             3.674    3.882    2.869    1.943    1.632    1.334

    STD. DEVIATIONS          0.236    0.315    0.325    0.993    0.950    1.556
                             1.291    1.130    1.114    0.838    0.460    0.245

  LATERAL DRAINAGE COLLECTED FROM LAYER  3
  ----------------------------------------
    TOTALS                   1.8123   1.2387   1.5801   0.6518   0.4959   0.4698
                             1.0469   2.1425   1.9966   1.1083   0.8484   1.4169

    STD. DEVIATIONS          1.5942   0.9783   1.0705   0.4728   0.6122   0.5401
                             1.3176   1.6285   1.4215   0.9077   0.9268   1.2402

  PERCOLATION/LEAKAGE THROUGH LAYER  5
  ------------------------------------
    TOTALS                   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  LATERAL DRAINAGE COLLECTED FROM LAYER  9
  ----------------------------------------
    TOTALS                   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  PERCOLATION/LEAKAGE THROUGH LAYER 11
  ------------------------------------
    TOTALS                   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  4
  -------------------------------------
    AVERAGES                 0.0006   0.0004   0.0005   0.0002   0.0002   0.0001
                             0.0003   0.0007   0.0006   0.0003   0.0003   0.0004

    STD. DEVIATIONS          0.0005   0.0003   0.0003   0.0001   0.0002   0.0002
                             0.0004   0.0005   0.0004   0.0003   0.0003   0.0004

  DAILY AVERAGE HEAD ON TOP OF LAYER 10
  -------------------------------------
    AVERAGES                 0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                             0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

```
                           0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

*******************************************************************************


*******************************************************************************

     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS   1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES            CU. FEET       PERCENT
                               --------------------  -------------   ---------
 PRECIPITATION                  46.00    (   6.750)     166981.2     100.00

 RUNOFF                          1.028   (  0.9984)       3731.38      2.235

 EVAPOTRANSPIRATION             30.139   (  3.2305)     109404.31     65.519

 LATERAL DRAINAGE COLLECTED     14.80811 (  4.49133)     53753.422   32.19130
   FROM LAYER  3

 PERCOLATION/LEAKAGE THROUGH     0.00004 (  0.00001)         0.150     0.00009
   LAYER  5

 AVERAGE HEAD ON TOP             0.000 (    0.000)
   OF LAYER  4

 LATERAL DRAINAGE COLLECTED      0.00004 (  0.00001)         0.142    0.00008
   FROM LAYER  9

 PERCOLATION/LEAKAGE THROUGH     0.00000 (  0.00000)         0.008     0.00001
   LAYER 11

 AVERAGE HEAD ON TOP             0.000 (    0.000)
   OF LAYER 10

 CHANGE IN WATER STORAGE         0.025   (  1.4874)         91.93      0.055
*******************************************************************************


0
******************************************************************************

                PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              6.50         23595.000

      RUNOFF                                     2.486         9022.5645

      DRAINAGE COLLECTED FROM LAYER  3           1.78152       6466.90527

      PERCOLATION/LEAKAGE THROUGH LAYER  5       0.000003         0.01198

      AVERAGE HEAD ON TOP OF LAYER  4            0.017

      MAXIMUM HEAD ON TOP OF LAYER  4            0.030

      LOCATION OF MAXIMUM HEAD IN LAYER  3
            (DISTANCE FROM DRAIN)                0.0 FEET
```

```
          DRAINAGE COLLECTED FROM LAYER  9           0.00000           0.00859

          PERCOLATION/LEAKAGE THROUGH LAYER 11       0.000000          0.00002

          AVERAGE HEAD ON TOP OF LAYER 10            0.000

          MAXIMUM HEAD ON TOP OF LAYER 10            0.007

          LOCATION OF MAXIMUM HEAD IN LAYER  9
                (DISTANCE FROM DRAIN)                0.0 FEET

          SNOW WATER                                 2.89          10491.8437


          MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.4050

          MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1040


           ***  Maximum heads are computed using McEnroe's equations.  ***

                Reference:  Maximum Saturated Depth over Landfill Liner
                            by Bruce M. McEnroe, University of Kansas
                            ASCE Journal of Environmental Engineering
                            Vol. 119, No. 2, March 1993, pp. 262-270.

    ******************************************************************************



    O
    ******************************************************************************

                       FINAL WATER STORAGE AT END OF YEAR   30
        ----------------------------------------------------------------------
                        LAYER        (INCHES)       (VOL/VOL)
                        -----        --------       ---------
                          1            1.4420         0.2403

                          2            5.1709         0.2873

                          3            0.0038         0.0128

                          4            0.0000         0.0000

                          5            7.5420         0.4190

                          6            1.3320         0.2220

                          7          728.8320         0.2920

                          8            4.3920         0.2440

                          9            0.0027         0.0100

                         10            0.0000         0.0000

                         11            0.1500         0.7500

                     SNOW WATER        0.000
```

LEACHATE DISCHARGE

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HDR Computation

Job Number	01743-02889-018	No.	
Project	SPSA Regional Landfill	Computed	DTD
		Date	8/27/2008
Subject	Cell VII Part B Permit Application	Checked	GMW
		Date	8/27/2008
Task	Leachate Discharge Quantities	Sheet	1
		Of	3

Objective:

Determine the actual leachate generation of the Regional Landfill based on historical data.

Reference:

HRSD leachate discharge records.

Cells I-IV =	103	AC
Cell V =	43.6	AC
Cell VI Ph1 =	20	AC
Cell VI Ph2 =	21	AC

Month/Year	Month/Year	Monthly Total (in gallons)	Avg GPD to Date	Gal/Ac/Day	Comments
Apr-04	Apr-04	950,387	32,772	224	
May-04	May-04	493,473	16,449	112	
Jun-04	Jun-04	546,569	18,847	129	
Jul-04	Jul-04	662,085	22,070	151	
Aug-04	Aug-04	1,137,516	37,917	259	
Sep-04	Sep-04	511,482	17,637	120	
Oct-04	Oct-04	750,927	25,031	171	
Nov-04	Nov-04	520,730	17,956	122	
Dec-04	Dec-04	1,435,202	47,840	326	
Jan-05	Jan-05	586,093	19,536	133	
Feb-05	Feb-05	576,203	21,341	146	
Mar-05	Mar-05	749,620	24,987	170	
Apr-05	Apr-05	603,337	20,805	142	
May-05	May-05	585,951	19,532	133	
Jun-05	Jun-05	489,832	16,891	115	
Jul-05	Jul-05	556,726	18,558	127	
Aug-05	Aug-05	436,158	14,539	99	
Sep-05	Sep-05	226,460	7,809	53	
Oct-05	Oct-05	781,652	26,055	178	
Nov-05	Nov-05	612,909	21,135	144	
Dec-05	Dec-05	700,803	23,360	159	
Jan-06	Jan-06	864,388	28,813	197	
Feb-06	Feb-06	492,121	18,227	124	
Mar-06	Mar-06	608,510	20,284	138	
Apr-06	Apr-06	350,484	12,086	82	
May-06	May-06	459,158	15,305	104	
Jun-06	Jun-06	889,837	30,684	209	
Jul-06	Jul-06	527,448	17,582	120	
Aug-06	Aug-06	294,461	9,815	67	
Sep-06	Sep-06	3,376,092	116,417	794	
Oct-06	Oct-06	5,851,657	195,055	1,171	Cell VI Ph1 Opened
Nov-06	Nov-06	4,026,098	138,831	833	
Dec-06	Dec-06	1,652,840	55,095	331	
Jan-07	Jan-07	869,837	28,995	174	
Feb-07	Feb-07	762,633	28,246	170	
Mar-07	Mar-07	777,393	25,913	156	
Apr-07	Apr-07	1,188,726	40,991	246	
May-07	May-07	730,103	24,337	146	
Jun-07	Jun-07	1,078,856	37,202	223	
Jul-07	Jul-07	381,232	12,708	76	
Aug-07	Aug-07	923,347	30,778	185	
Sep-07	Sep-07	397,297	13,700	82	
Oct-07	Oct-07	1,083,914	36,130	217	Cells I-IV covered w/geomembrane
Nov-07	Nov-07	328,320	11,321	68	
Dec-07	Dec-07	897,600	29,920	180	
Jan-08	Jan-08	1,064,804	35,493	213	
Feb-08	Feb-08	1,606,314	59,493	317	Cell VI Ph2 Opened
Mar-08	Mar-08	2,132,360	71,079	379	
Apr-08	Apr-08	1,963,042	67,691	361	
May-08	May-08	1,912,532	63,751	340	
Jun-08	Jun-08	741,598	25,572	136	

Maximum Daily Leachate Flow =	**1,171**	**gpad**
Minimum Daily Leachate Flow =	**53**	**gpad**
Average Daily Leachate Flow =	**217**	**gpad**

HDR Computation

Job Number	01743-02889-018	**No.**	
Project	SPSA Regional Landfill	**Computed** DTD	**Date** 8/27/2008
Subject	Cell VII Part B Permit Application	**Checked** GMW	**Date** 8/27/08
Task	Leachate Discharge Quantities	**Sheet** 2	**Of** 3

Objective:

Determine the actual leachate generation of the Regional Landfill based on historical data.

Reference:

HRSD leachate discharge records.

Cells I-IV =	103	AC
Cell V =	43.6	AC
Cell VI Ph1 =	20	AC
Cell VI Ph2 =	21	AC

Month/Year	Month/Year	Monthly Total (in gallons)	Avg GPD to Date	Gal/Ac/Day
Mar-99	Mar-99	611,800	20,393	139
Apr-99	Apr-99	293,510	10,121	69
May-99	May-99	444,405	14,814	101
Jun-99	Jun-99	354,102	12,210	83
Jul-99	Jul-99	387,423	12,914	88
Aug-99	Aug-99	429,483	14,316	98
Sep-99	Sep-99	1,234,801	42,579	290
Oct-99	Oct-99	698,720	23,291	159
Nov-99	Nov-99	524,921	18,101	123
Dec-99	Dec-99	283,863	9,462	65
Jan-00	Jan-00	1,470,592	49,020	334
Feb-00	Feb-00	1,588,906	56,747	387
Mar-00	Mar-00	1,040,752	34,692	237
Apr-00	Apr-00	1,015,477	35,016	239
May-00	May-00	1,085,679	36,189	247
Jun-00	Jun-00	1,274,107	43,935	300
Jul-00	Jul-00	574,425	19,148	131
Aug-00	Aug-00	1,248,036	41,601	284
Sep-00	Sep-00	830,884	28,651	195
Oct-00	Oct-00	1,014,039	33,801	231
Nov-00	Nov-00	381,039	13,139	90
Dec-00	Dec-00	298,356	9,945	68
Jan-01	Jan-01	464,650	15,488	106
Feb-01	Feb-01	672,037	24,890	170
Mar-01	Mar-01	1,062,670	35,422	242
Apr-01	Apr-01	646,554	22,295	152
May-01	May-01	1,271,460	42,382	289
Jun-01	Jun-01	1,535,652	52,954	361
Jul-01	Jul-01	601,486	20,050	137
Aug-01	Aug-01	1,254,369	41,812	285
Sep-01	Sep-01	1,151,924	39,722	271
Oct-01	Oct-01	490,058	16,335	111
Nov-01	Nov-01	289,833	9,994	68
Dec-01	Dec-01	764,559	25,485	174
Jan-02	Jan-02	2,035,819	67,861	463
Feb-02	Feb-02	1,843,637	68,283	466
Mar-02	Mar-02	1,612,715	53,757	367
Apr-02	Apr-02	1,823,124	62,866	429
May-02	May-02	1,868,388	62,280	425
Jun-02	Jun-02	935,192	32,248	220
Jul-02	Jul-02	972,687	32,423	221
Aug-02	Aug-02	1,159,734	38,658	264
Sep-02	Sep-02	1,483,731	51,163	349
Oct-02	Oct-02	904,880	30,163	206
Nov-02	Nov-02	1,233,835	42,546	290
Dec-02	Dec-02	723,130	24,104	164
Jan-03	Jan-03	751,579	25,053	171
Feb-03	Feb-03	1,472,176	54,525	372
Mar-03	Mar-03	1,149,333	38,311	261
Apr-03	Apr-03	1,123,407	38,738	264
May-03	May-03	646,292	21,543	147
Jun-03	Jun-03	1,241,883	42,824	292
Jul-03	Jul-03	832,298	27,743	189
Aug-03	Aug-03	731,399	24,380	166
Sep-03	Sep-03	712,443	24,567	168
Oct-03	Oct-03	1,094,620	36,487	249
Nov-03	Nov-03	1,346,383	46,427	317
Dec-03	Dec-03	1,799,717	59,991	409
Jan-04	Jan-04	1,795,628	59,854	408
Feb-04	Feb-04	901,028	32,180	220
Mar-04	Mar-04	1,151,887	38,396	262

Maximum Daily Leachate Flow =	**466**	**gpad**
Minimum Daily Leachate Flow =	**65**	**gpad**
Average Daily Leachate Flow =	**231**	**gpad**

HDR Computation

Job Number	01743-02889-018	No.	
Project	SPSA Regional Landfill	Computed	DTD
		Date	8/27/2008
Subject	Cell VII Part B Permit Application	Checked	GMW
		Date	8/27/08
Task	Leachate Discharge Quantities	Sheet	3
		Of	3

Conclusion:

Maximum Daily Leachate Flow =	**1,171**	**gpad**
Minimum Daily Leachate Flow =	**53**	**gpad**
Average Daily Leachate Flow =	**224**	**gpad**

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	April 2008
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed May 9, 2008
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	4-7-08 Monthly leachate: pH/Phenols/Cyanide HRSD Metals/BOD Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station   Account No. 3473040009

Service Location 3136 Woodland Drive   City Norfolk

				Circle One
Meter S/N 99824707	Date Read 5 / 9 / 08	Reading* 340180	CF [✓ GAL]
Meter S/N	Date Read / /	Reading*	CF GAL
Meter S/N	Date Read / /	Reading*	CF GAL
Meter S/N	Date Read / /	Reading*	CF GAL
Meter S/N	Date Read / /	Reading*	CF GAL
Meter S/N	Date Read / /	Reading*	CF GAL
Meter S/N	Date Read / /	Reading*	CF GAL
Meter S/N	Date Read / /	Reading*	CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy   **Title** Environmental Compliance Coordinator
(printed)

Signature Amy E. Hardy   **Date** 5-9-08

Revised 06/11/07

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 08040111

Industry Name:	SPSA-LF
Event Name:	RL HRSD Leachate Discharge
Laboratory Sample I.D.:	08040111-001
Customer Sample ID:	Leachate Pond
Sample Pt. Address:	Nansemond Parkway
Sample Pt. Location:	Discharge side of the #1 (Leachate Pond)
Industrial Waste Code:	SPSA004
Sample Point Code:	1
Sampled By:	Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.8 SU	--	04/07/08 1206	04/07/08 1208	SM18/4500-H B	Client
Phenols	0.15 mg/L	0.05	04/07/08 1206	04/14/08 1035	EPA420.1	RPF
CN-	< 0.01 mg/L	0.01	04/07/08 1206	04/09/08 1017	Kelada-01	LG

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: for
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 5/9/2008

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 08040111

Industry Name: SPSA-LF
Event Name: RL HRSD Leachate Discharge
Laboratory Sample I.D.: 08040111-002
Customer Sample ID: Leachate Pond
Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)
Industrial Waste Code: SPSA004
Sample Point Code: 1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	37.9 mg/L	2.0	04/07/08 1204	04/07/08 1415	04/09/08 1332	SM18/5210B	RPF
Cu	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Cr	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Zn	0.026 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Ni	0.032 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Cd	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
As	0.040 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Hg	< 0.0002 mg/L	0.0002	04/07/08 1204	04/07/08 1415	04/14/08 1038	EPA245.1/R3.0	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 5/9/2008

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME:	SPSA	PROJECT NAME:	Regional LF HRSD Monthly Leachate
CLIENT CONTACT:	Amy Hardy	SITE NAME:	RL HRSD Leachate Discharge
CLIENT ADDRESS:	1 Bob Foeller Dr., Suffolk, VA 23434	PROJECT NUMBER:	
CLIENT PHONE NUMBER:	(757) 539-9373 x 7	P.O. NUMBER:	4500031018
CLIENT FAX NUMBER:	(757) 539-9379 EMAIL: ahardy@spsa.com	REGULATORY AUTHORITY:	

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE: Charles Williams

Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX							ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	Cu,Cr,Zn,Pb,Ni,Cd,Hg,As (HNO3)	BOD	Phenolics (H2SO4)	CN- (NaOH)			ALL SAMPLES TRANSPORTED TO LAB ON ICE	PH CAL @1135 pH = 7.83@1208 TEMP = 14.1°C FLOW STARTED 1203 FLOW OCCURRED 1412 SAMPLES POURED 1417 PHENOLS POS @1210. ADDED FAS TO REMOVE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			4-7-08	1203	2	✓				✓							1	1				INTERFERENCE
2) LEACHATE POND	4-7-08	1204	4-7-08	1415	2		✓			✓					1	1						WAS ABLE TO
3)																						REMOVE
4)															5/9/08 client requested							INTERFERENCE
5)															we change stop							PROCEED WITH
6)															time to 12:00							ANALYSIS
7)																						
8)																						
9)																						
10)																						

RELINQUISHED: Charles Williams	DATE / TIME 4-7-08/1523	RECEIVED: COURIER	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME 4/8/08 1200
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐

LAB USE ONLY

COOLER TEMP ___ °C

SPSA-LF 08040111
RL HRSD Leachate Discharge DUE: 5 Days
Recd: 04/08/08

08040111

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08040111
SPSA-LF **08040111**
RL HRSD Leachate Discharge DUE: 5 Days
Recd: 04/08/08

Sample Conditions Checklist

Opened by: (print) Jessica Comstock **Lab ID No.:** ______

(sign) Jessica Comstock **Date Cooler Opened:** 4/8/08

1. How were samples received?

Fed Ex ☐
UPS ☐
Courier ☑
Walk In ☐

		YES	NO	N/A
2.	Were custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all bottle labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 degrees Celsius +/-2)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month April Year 2008

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	5177459	32368	17	5913665	37360
2	5217088	39629	18	5951396	37731
3	5253432	36344	19	5951396	0
4	5286470	33038	20	5951396	0
5	5286470	0	21	6095316	143920
6	5286470	0	22	6264188	168872
7	5321355	34885	23	6420741	156553
8	5472625	151270	24	6570500	149759
9	5618621	145996	25	6720957	150457
10	5767471	148850	26	6720957	0
11	5767471	0	27	6720957	0
12	5767471	0	28	6871985	151028
13	5767471	0	29	7003071	131086
14	5800480	33009	30	7081133	78062
15	5835683	35203	31	----------	
16	5876305	40622			

Monthly Total: 1936042 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name (print): Amy E. Hardy
Name (signature): Amy E. Hardy Date: 5-9-08
Title: Environmental Compliance Coordinator

TRANSMISSION VERIFICATION REPORT

TIME : 05/09/2008 15:31
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	05/09 15:29
FAX NO./NAME	4643985
DURATION	00:01:34
PAGE(S)	05
RESULT	OK
MODE	STANDARD ECM

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill
Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print
Signature

Field Log

Flow Established: 4/07/2008 @ 1203
Date / Time
Flow Secured: 4/07/2008 @ 1412
Date / Time

pH Meter: Beckman Model 255
Calibration: 4/07/2008 @ 1135
Date / Time

Buffer Solutions: 4.00 4.00 | 7.01 7.00 | 10.05 10.00
Result | Result | Result

Slope: 98.7
Calibration Verification: 8.00/8.01
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond
Sample Collection: 4/07/2008 @ 1206
Date / Time

pH Result: 7.83 Temp=14.1
Time of Analysis: 1208

Phenols Interference Check: Positive
(Positive or Negative)
1210
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **4/07/2008 @ 1204**
Date / Time
Composite Stop: **4/07/2008 @ 1415**
Date / Time

Comments: Could remove in interference from sample with FAS. Sent for analysis.

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Laboratory Order ID: 08040111

Industry Name: SPSA-LF
Event Name: RL HRSD Leachate Discharge
Laboratory Sample I.D.: 08040111-001
Customer Sample ID: Leachate Pond
Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)
Industrial Waste Code: SPSA004
Sample Point Code: 1
Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time 1200	Analysis Date/Time	Analysis Method	Analyst
pH	7.8 SU	--	04/07/08 ~~1203~~	04/07/08 1208	SM18/4500-H B	Client
Phenols	0.15 mg/L	0.05	04/07/08 ~~1203~~	04/14/08 1035	EPA420.1	RPF
CN-	< 0.01 mg/L	0.01	04/07/08 ~~1203~~	04/09/08 1017	Kelada-01	LG

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Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 4/15/2008

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Laboratory Order ID: 08040111

Industry Name: SPSA-LF
Event Name: RL HRSD Leachate Discharge
Laboratory Sample I.D.: 08040111-002
Customer Sample ID: Leachate Pond
Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)
Industrial Waste Code: SPSA004
Sample Point Code: 1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	37.9 mg/L	2.0	04/07/08 1204	04/07/08 1415	04/09/08 1332	SM18/5210B	RPF
Cu	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Cr	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Zn	0.026 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Ni	0.032 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Cd	< 0.01 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
As	0.040 mg/L	0.010	04/07/08 1204	04/07/08 1415	04/10/08 1517	EPA200.7/R4.4	CGT
Hg	< 0.0002 mg/L	0.0002	04/07/08 1204	04/07/08 1415	04/14/08 1038	EPA245.1/R3.0	DMH

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Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 4/15/2008

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy Hardy
CLIENT ADDRESS: 1 Bob Foeller Dr., Suffolk, VA 23434
CLIENT PHONE NUMBER: (757) 539-9373 x 7
CLIENT FAX NUMBER: (757) 539-9379
EMAIL: ahardy@spsa.com
PROJECT NAME: Regional LF HRSD Monthly Leachate
SITE NAME: RL HRSD Leachate Discharge
PROJECT NUMBER:
P.O. NUMBER: 4500031018
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: 5 Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX							ANALYSIS						COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other ___	Cu,Cr,Zn,Pb,Ni,Cd,Hg,As (HNO3)	BOD	Phenolics (H2SO4)	CN- (NaOH)			ALL SAMPLES TRANSPORTED TO LAB ON ICE	PH CAL @ 1135 pH = 7.83 @ 1208 TEMP = 14.1°C FLOW STARTED 1203 FLOW SECURED 1412 SAMPLES POURED 1417 PHENOLS POD @ 1210. ADDED FAS TO REMOVE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			4-7-08	1203	2	✓				✓							1	1				INTERFERENCE
2) LEACHATE POND	4-7-08	1204	4-7-08	1415	2		✓			✓					1	1						WAS ABLE TO
3)																						REMOVE
4)																						INTERFERENCE
5)																						PROCEED WITH
6)																						ANALYSIS
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	4-7-08/1523	COURIER	
			4/8/08 1200

QC Data Package
Level I ☐
Level II ☐
Level III ☐

LAB USE ONLY
COOLER TEMP ___°C
SPSA-LF 08040111
RL HRSD Leachate Discharge
DUE: 5 Days
Recd: 04 8
08040111

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08040111
SPSA-LF **08040111**
RL HRSD Leachate Discharge
DUE: 5 Days
Recd: 04/08/08

Sample Conditions Checklist

Opened by: (print) Jessica Comstock **Lab ID No.:**

(sign) Jessica Comstock **Date Cooler Opened:** 4/8/08

		YES	NO	N/A
1.	How were samples received?			
	Fed Ex ☐ UPS ☐ Courier ☑ Walk In ☐			
2.	Were custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all bottle labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 degrees Celsius +/-2)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	March 2008
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed April 10, 2008
Number of Pages:	6

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	3-11-08 Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station
Account No. 3473040009

Service Location 3136 Woodland Drive
City Norfolk

			Circle One
Meter S/N 99824707	Date Read 3/31/08	Reading* 335720	CF [✓ GAL]
Meter S/N	Date Read ___/___/___	Reading*	CF GAL
Meter S/N	Date Read ___/___/___	Reading*	CF GAL
Meter S/N	Date Read ___/___/___	Reading*	CF GAL
Meter S/N	Date Read ___/___/___	Reading*	CF GAL
Meter S/N	Date Read ___/___/___	Reading*	CF GAL
Meter S/N	Date Read ___/___/___	Reading*	CF GAL
Meter S/N	Date Read ___/___/___	Reading*	CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy
(printed)

Title Environmental Compliance Coordinator

Signature Amy E. Hardy

Date 4-9-08

Revised 06/11/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name: Southeastern Public Service Authority
Sample Point Address: #1 Bob Foeller Drive, Suffolk, VA.
Location: Regional Landfill (Permit # 0087)

Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.1	SU	----	03-11-08 09:11	03-11-08 09:13	SM 4500-HB	CEW
Total Phenols	----	mg/l	0.021	03-11-08 09:11	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy
Date: 4/9/08

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Laboratory Order ID: 08030194

Industry Name: SPSA-LF
Event Name: RL HRSD Leachate Discharge
Laboratory Sample I.D.: 08030194-001
Customer Sample ID: Leachate Pond / Permitted Point
Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)
Industrial Waste Code: SPSA004
Sample Point Code: 1
Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.1 SU	--	03/11/08 911	03/11/08 913	SM18/4500-H B	Client
CN-	0.04 mg/L	0.01	03/11/08 911	03/13/08 1051	Kelada-01	LG

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and a[illegible]achments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 4/9/2008

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Laboratory Order ID: 08030194

Industry Name: SPSA-LF
Event Name: RL HRSD Leachate Discharge
Customer Sample ID: Leachate Pond / Permitted Point
Sample Pt. Address: Nansemond Parkway

Laboratory Sample I.D.: 08030194-003

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)
Industrial Waste Code: SPSA004
Sample Point Code: 1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	25.6 mg/L	2.0	03/11/08 907	03/11/08 1613	03/12/08 940	SM18/5210B	VLG
	The GGA exhibited low recovery.						
Cu	0.010 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Cr	< 0.01 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Zn	0.042 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Pb	< 0.01 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Ni	0.030 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Cd	< 0.01 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
As	0.035 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Hg	< 0.002 mg/L	0.0020	03/11/08 907	03/11/08 1613	04/09/08 1749	EPA245.1/R3.0	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: for Ted Soyars
Title: Laboratory Manager

Date Issued: 4/9/2008

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month March Year 2008

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	3012311	0	17	4720381	0
2	3012311	0	18	4720381	0
3	3046234	33923	19	4904565	184184
4	3046234	0	20	4904565	0
5	3080685	34451	21	4973184	68619
6	3219925	139240	22	4973184	0
7	3394123	174198	23	4973184	0
8	3566157	172034	24	5008562	35378
9	3746790	180633	25	5042064	33502
10	3746790	0	26	5080064	38000
11	3920363	173153	27	5115692	35628
12	4102692	182329	28	5115692	0
13	4286521	183829	29	5115692	0
14	4470582	184061	30	5115692	0
15	4583820	113238	31	5145091	29399
16	4720381	136561			

Monthly Total: 2132360 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name (print): Amy E. Hardy
Name (signature): Amy E. Hardy
Date: 4-9-08
Title: Environmental Compliance Coordinator

AIR WATER SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

Regional LF

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: HRSD MONTHLY LEACHATE
CLIENT CONTACT: CHARLES WILLIAMS	SITE NAME: ~~REGIONAL LANDFILL~~ RL HRSD Leachate Discharge
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-418-3562	P.O. NUMBER: 4500031018
CLIENT FAX NUMBER: 757-593-9379 EMAIL: cewilliams@spsa.com	REGULATORY AUTHORITY:
Is sample for compliance reporting? YES NO / Is sample from a chlorinated supply? YES NO	PWS I.D. #:
SAMPLER NAME (PRINT): Charles Williams / SAMPLER SIGNATURE:	Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) HNO3 500ml PLASTIC	CN- NaOH 250 ml PLASTIC					COMMENTS Quote I.D.: PHCAL @ 0780 PH POND = 7.12 TEMP = 12.1°C @ 0913 PH SUMP = 7.29 TEMP = 19.1 @ 0920 FLOW EST @ 0907 PHENOLS POS FOR POND @ 0915 COULD NOT REMOVE INTERFERENCE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			3-11-08	0911	1	✓				✓							1					PHENOLS POS
2) LEACHATE SUMP			3-11-08	0918	1	✓				✓							1					FOR SUMP @
3) LEACHATE POND	3-11-08	0907	3-11-08	1613	2		✓			✓					1	1						0923 COULD
4) LEACHATE SUMP	3-11-08	0909	3-11-08	1420	2		✓			✓					1	1						NOT REMOVE
5)																						INTERFERENCE
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	3-11-08/1440	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED: KU Walton	DATE / TIME 3/12/08-1250
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 0.5 °C

SPSA-LF
Regional Landfill

08030194
DUE: 10 Days
Recd: 03/12

1214.xls

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SPSA-LF
Regional Landfill

08030194
DUE: 10 Days
Recd: 03/12/08

Sample Conditions Checklist

Opened by: (print) Jill Waters
(sign) Jill Waters
Lab ID No.:
Date Cooler Opened: 3/12/08

1. How were samples received?
   - Fed Ex ☐
   - UPS ☐
   - Courier ☑
   - Walk In ☐

		YES	NO	N/A
2.	Were custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all bottle labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 degrees Celsius +/-2)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month March Year 2008

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	3012311	0	17	4720381	0
2	3012311	0	18	4720381	0
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6	3219925	139240	22	4973184	0
7	3394123	174198	23	4973184	0
8	3566157	172034	24	5008562	35378
9	3746790	180633	25	5042064	33502
10	3746790	0	26	5080064	38000
11	3920363	173153	27	5115692	35628
12	4102692	182329	28	5115692	0
13	4286521	183829	29	5115692	0
14	4470582	184061	30	5115692	0
15	4583820	113238	31	5145091	29399
16	4720381	136561			

Monthly Total: 2132360 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name (print): Amy E. Hardy
Name (signature): Amy E. Hardy Date: 4-9-08
Title: Environmental Compliance Coordinator

TRANSMISSION VERIFICATION REPORT

TIME : 04/10/2008 07:46
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	04/10 07:44
FAX NO./NAME	4643985
DURATION	00:01:52
PAGE(S)	06
RESULT	OK
MODE	STANDARD ECM

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Laboratory Order ID: 08030194

Industry Name: SPSA-LF
Event Name: RL HRSD Leachate Discharge
Laboratory Sample I.D.: 08030194-001
Customer Sample ID: Leachate Pond / Permitted Point
Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)
Industrial Waste Code: SPSA004
Sample Point Code: 1
Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.1 SU	--	03/11/08 911	03/11/08 913	SM18/4500-H B	Client
CN-	0.04 mg/L	0.01	03/11/08 911	03/13/08 1051	Kelada-01	LG

rtify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 4/9/2008

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Laboratory Order ID: 08030194

Industry Name:	SPSA-LF		
Event Name:	RL HRSD Leachate Discharge	Laboratory Sample I.D.:	08030194-003
Customer Sample ID:	Leachate Pond / Permitted Point		
Sample Pt. Address:	Nansemond Parkway		
Sample Pt. Location:	Discharge side of the #1 (Leachate Pond)		
Industrial Waste Code:	SPSA004		
Sample Point Code:	1		
Sampled By:	Charles E. Williams		

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	25.6 mg/L	2.0	03/11/08 907	03/11/08 1613	03/12/08 940	SM18/5210B	VLG
	The GGA exhibited low recovery.						
Cu	0.010 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Cr	< 0.01 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
[illegible]	0.042 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Pb	< 0.01 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Ni	0.030 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Cd	< 0.01 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
As	0.035 mg/L	0.010	03/11/08 907	03/11/08 1613	03/18/08 1045	EPA200.7/R4.4	CGT
Hg	< 0.002 mg/L	0.0020	03/11/08 907	03/11/08 1613	04/09/08 1749	EPA245.1/R3.0	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: for Ted Soyars
Title: Laboratory Manager

Date Issued: 4/9/2008

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Certificate of Analysis

Final Report

Laboratory Order ID 08030194

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	March 12, 2008 April 09, 2008
Submitted To:	Charles (Trey) Williams	Project Number:	NA
Client Site I.D.:	RL HRSD Leachate Discharge	Purchase Order	4500031018

Sample I.D.: Leachate Sump / Pumping Station — Laboratory Sample I.D.: 08030194-002

Date/Time Sampled: 03/11/08 09:18

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
pH	SM18/4500-H B	7.3 SU	--	03/11/08 9:18	Client
Cyanide	Kelada-01	0.04 mg/L	0.01	03/13/08 10:51	LG

Sample I.D.: Leachate Sump / Pumping Station — Laboratory Sample I.D.: 08030194-004

Date/Time Sampled (Start/Stop): 03/11/08 09:09 to 03/11/08 16:20

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
Arsenic	EPA200.7/R4.4	0.033 mg/L	0.010	03/18/08 10:45	CGT
Cadmium	EPA200.7/R4.4	< 0.01 mg/L	0.010	03/18/08 10:45	CGT
Chromium	EPA200.7/R4.4	< 0.01 mg/L	0.010	03/18/08 10:45	CGT
Copper	EPA200.7/R4.4	< 0.01 mg/L	0.010	03/18/08 10:45	CGT
Lead	EPA200.7/R4.4	< 0.01 mg/L	0.010	03/18/08 10:45	CGT
Mercury	EPA245.1/R3.0	< 0.002 mg/L	0.0020	04/09/08 17:42	DMH
Nickel	EPA200.7/R4.4	0.029 mg/L	0.010	03/18/08 10:45	CGT
Zinc	EPA200.7/R4.4	0.039 mg/L	0.010	03/18/08 10:45	CGT
BOD	SM18/5210B	23.5 mg/L	2.0	03/12/08 9:40	VLG

The GGA exhibited low recovery.

for Ted Soyars
Laboratory Manager

AIR WATER & SOIL LABORATORIES, INC.

RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

Regional LF PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: CHARLES WILLIAMS
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA
CLIENT PHONE NUMBER: 757-418-3562
CLIENT FAX NUMBER: 757-593-9379
EMAIL: cewilliams@spsa.com
Is sample for compliance reporting? YES NO

PROJECT NAME: HRSD MONTHLY LEACHATE
SITE NAME: ~~REGIONAL LANDFILL~~ RL HRSD Leachate Discharge
PROJECT NUMBER:
P.O. NUMBER: 4500031018
REGULATORY AUTHORITY:
Is sample from a chlorinated supply? YES NO
PWS I.D. #:

SAMPLER NAME (PRINT): Charles Williams
SAMPLER SIGNATURE:
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg Ni, Zn) HNO3 500ml PLASTIC	CN⁻ NaOH 250 ml PLASTIC					Quote I.D.: PHCAL @0730 PH POND= 7.12 TEMP= 12.1°C @0913 PH SUMP= 7.29 TEMP= 18.1 @0920 FLOW EST @0907 PHENOLS POS FOR POND @ 0915 COULD NOT REMOVE INTERFERENCE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			3-11-08	0911	1	✓				✓							1					PHENOLS POS
2) LEACHATE SUMP			3-11-08	0918	1	✓				✓							1					FOR SUMP @
3) LEACHATE POND	3-11-08	0907	3-11-08	1613	2		✓			✓					1	1						0923 COULD
4) LEACHATE SUMP	3-11-08	0909	3-11-08	1420	2		✓			✓					1	1						NOT REMOVE
5)																						INTERFERENCE
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	3-11-08/1440	COURIER	
		Walton	3/12/08-1250

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 0.5 °C

SPSA-LF
Regional Landfill

08030194
DUE: 10 Days
Recd: 03/12/08

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SPSA-LF
Regional Landfill

08030194
DUE: 10 Days
Recd: 03/12/08

Sample Conditions Checklist

Opened by: (print) Jill Waters

(sign) Jill Waters

Lab ID No.:

Date Cooler Opened: 3/12/08

		YES	NO	N/A
1.	How were samples received? Fed Ex ☐ UPS ☐ Courier ☑ Walk In ☐			
2.	Were custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all bottle labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 degrees Celsius +/-2)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams (Print)

Signature

Field Log

Flow Established: 3/11/08 @ 0907 (Date / Time)

Flow Secured: 3/11/2008 @1610 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 3/11/2008 @ 0720 (Date / Time)

Buffer Solutions:	4.00 4.00	7.01 7.00	10.05 10.00
	Result	Result	Result

Slope: 99.1

Calibration Verification: 8.00/7.95 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 3/11/2008 @ 0911 (Date / Time)

pH Result: 7.12 @ 12.1 C

Time of Analysis: 0913

Phenols Interference Check: Positive (Positive or Negative)

0915 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **3/11/2008 @ 0907** (Date / Time)

Composite Stop: **3/11/2008 @ 1613** (Date / Time)

Comments: Added FAS to phenols until total absorption. Could not remove interference.

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	February 2008
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed March 7, 2008
Number of Pages:	10

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	2-1-08 CN Split Sample 2-5-08 Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA 2-19-08 – 2-20-08 CN Resamples	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station
Account No. 3473040009

Service Location 3136 Woodland Drive
City Norfolk

Circle One

Meter S/N 99824707 Date Read 2/29/08 Reading* 333340 CF [✓ GAL]
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL
Meter S/N ______ Date Read ___/___/___ Reading* ______ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy
(printed)

Title Environmental Compliance Coordinator

Signature Amy E. Hardy

Date 3-7-08

Revised 06/11/07

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Certificate of Analysis

Final Report

Laboratory Order ID 08020017

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	February 04, 2008 February 04, 2008
Submitted To:	Amy Hardy	Project Number:	4500024514
Client Site I.D.:	Leachate CN- Split SPSA 004 #1	Purchase Order	450003108

Sample I.D.: Leachate Pond / Regional Landfill

Laboratory Sample I.D.: 08020017-001

Date/Time Sampled: 02/01/08 10:20

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.10 mg/L	0.01	02/04/08 10:01	LG

Ted Soyars

Laboratory Manager

AIR WATER & SOIL LABORATORIES, INC.

RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373 X7
CLIENT FAX NUMBER: 757-539-9379
EMAIL:
PROJECT NAME: LEACHATE CN⁻ SPLIT SPSA 004 #1
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): PAUL WALTERS
SAMPLER SIGNATURE:
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS: CN⁻ 250ml PLASTIC NaOH							COMMENTS: Quote I.D.: FLOW EST@ 1000 SPLIT SAMPLE WITH HRSD INDUSTRIAL WASTE DIVISON PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			2-1-08	1030	1	✓				✓					1							
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	2-1-08/1100	COURIER	
			2-4-08 8:57

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 5.4 °C

08020017

SPSA-LF
Leachate CN- Split SPSA 004

08020017
DUE: 10 Days
Recd: 02/ 8

214.xls

AIR WATER & SOIL Laboratories, Inc.

2109A North Hamilton Street ▸ Richmond, Virginia 23230 ▸ Tel

SPSA-LF **08020017**
Leachate CN- Split SPSA 004
DUE: 10 Days
Recd: 02/04/08

Sample Conditions Ch

Opened by: (print) A. McGinley

(sign) A. McGinley

Lab ID No.: ____________________

Date Cooler Opened: 2-4-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☑	ACM ☑	☐
2.	If not, are custody seals used?	☐	☑	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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____

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____

AIR WATER & SOIL
LABORATORIES, INC.®
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Laboratory Order ID: 08020067

Industry Name: SPSA-LF
Sample Pt. Address: HRSD Monthly Leachate
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 08020067-003

Industrial Waste Code: SPSA 004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.7 SU	--	02/05/08 0905	02/05/08 0908	SM4500-H B	Client

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false in[illegible]ation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 2/15/2008

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Laboratory Order ID: 08020067

Industry Name: SPSA-LF
Sample Pt. Address: HRSD Monthly Leachate
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 08020067-002

Industrial Waste Code: SPSA 004
Sample Point Code: #1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	See Attached	2.0	02/05/08 0903	02/05/08 1140		SM5210B	
COD	639 mg/L	10.0	02/05/08 0903	02/05/08 1140	02/12/08 0000	EPA410.4	VLG
Cu	0.032 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
Cr	0.018 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
Zn	0.106 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
Pb	0.014 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
Ni	0.054 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
As	0.054 mg/L	0.010	02/05/08 0903	02/05/08 1140	02/13/08 1601	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	02/05/08 0903	02/05/08 1140	02/11/08 1059	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 2/15/2008

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Laboratory Order ID: 08020067

Industry Name: SPSA-LF
Sample Pt. Address: HRSD Monthly Leachate
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 08020067-001

Industrial Waste Code: SPSA 004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
CN-	0.13 mg/L	0.01	02/05/08 1133	02/11/08 1017	Kelada-01	LG

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 2/15/2008

AIR WATER SOIL LABORATORIES, INC.

RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

LIENT NAME:	SPSA	PROJECT NAME:	HRSD Monthly Leachate
LIENT CONTACT:	Amy Hardy	SITE NAME:	SPSA Regional Landfill
LIENT ADDRESS:	1 Bob Foeller Dr., Suffolk, VA 23434	PROJECT NUMBER:	
LIENT PHONE NUMBER:	(757) 539-9373 x 7	P.O. NUMBER:	4500031018
LIENT FAX NUMBER:	(757) 539-9379 EMAIL: ahardy@spsa.com	REGULATORY AUTHORITY:	

s sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

AMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

ave ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	Cu,Cr,Zn,Pb,Ni,Cd,Hg,As (HNO3)	BOD	Phenolics (H2SO4)	COD H2SO4	CN- NaOH			COMMENTS
								MATRIX							ANALYSIS							PH CALC@0810 PH GRAB@0905 PH = 7.73@0908 TEMP= 16.8°C FLOW EST@0904 FLOW SECURED@ 1139 COMPOSITE POURED @1143 PHENOLS GRABBED @0905 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			2-5-08	1133	1	✓				✓									1			PHENOLS POS
2) LEACHATE POND	2-5-08	0903	2-5-08	1140	3		✓			✓					1	1		1				@0910 ADDED
3)																						FAS TO TOTAL
4)																						AS PORTION
5)																						BUT COULD
6)																						NOT REMOVE
7)																						INTERFERENCE
8)																						
9)																						
10)																						

ELINQUISHED:	DATE / TIME 2-5-08/1400	RECEIVED: COURIER	DATE / TIME
ELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME 2-6-08 12:55
ELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 2.1 °C

SPSA-LF
HRSD Monthly Leachate

08020067
DUE: 5 Days
Recd: 02/06/08

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08020067

SPSA-LF **08020067**
HRSD Monthly Leachate
DUE: 5 Days
Recd: 02/06/08

Sample Conditions Chec

Opened by: (print) A. McGinley

(sign) A. McGinley

Lab ID No.:

Date Cooler Opened: 2-10-08

		YES	NO	N/A
1.	How were samples received? Fed Ex ☐ UPS ☐ Courier ☑ Walk In ☐			
2.	Were custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all bottle labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 degrees Celsius +/-2)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

February 14, 2008

CARMELA TOMBES
AIR WATER & SOIL
2109-A NORTH HAMILTON STREET
RICHMOND, VA 23230

Purchase Order:

Client ID: AWS-2/6/08 1510
Workorder: 8037013

Dear CARMELA TOMBES:

Enclosed are the analytical results for sample(s) received by the laboratory on Wednesday, February 06, 2008. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please call the Client Services Dept. at 1-800-888-8061.

Sincerely,

Dawn A. Casto

DAWN CASTO

Unless otherwise specified all analyses of solid materials are based on dry weight.

The signatures at the end of this report certify that the results are based on the referenced methods and unless otherwise noted meet the requirements of NELAC.

Reported results relate only to the items tested, as received by the laboratory.

On-site analysis (analysis ASAP) is recommended for the following tests: pH, temperature,dissolved oxygen,residual chlorine and sulfite. When performed off-site, these tests do not meet the NELAC standards.

Abbreviations:
ug/L = micrograms per Liter, mg/L = milligrams per Liter, ug/g micrograms per gram, mg/kg = milligrams per kilogram
ug/wp = micrograms per wipe, ug/ml = micrograms per milliliter, uS = microsiemens per centimeter at 25 degrees Celsius
ppb = parts per billion, DF = Dilution Factor

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

SAMPLE SUMMARY

Workorder: 8037013 AWS-2/6/08 1510

Lab ID	Sample ID	Matrix	Received Cond	Date Collected	Date Received
8037013001	08020059-001	Aqueous Liquid	OK	2/6/2008 08:08	2/6/2008 15:10
8037013002	08020059-002	Aqueous Liquid	OK	2/6/2008 08:20	2/6/2008 15:10
8037013003	08020059-003	Aqueous Liquid	OK	2/6/2008 08:45	2/6/2008 15:10
8037013004	08020067-002	Aqueous Liquid	OK	2/5/2008 11:40	2/6/2008 15:10
8037013005	08020069-001	Aqueous Liquid	OK	2/5/2008 14:00	2/6/2008 15:10
8037013006	08020069-002	Aqueous Liquid	OK	2/5/2008 15:00	2/6/2008 15:10

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005

Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS

Workorder 8037013 AWS-2/6/08 1510

Lab ID:	8037013001	Date Received:	2/6/2008 15:10	Matrix:	Aqueous Liquid
Sample ID:	08020059-001	Date Collected:	2/6/2008 08:06	TYPE:	NA

Analysis Desc: SM 5210 B

Preparation Method: SM 5210 B

Analytical Method: SM 5210 B

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	Qual	Re
BOD	401	mg/L	2.00	1	02/07/2008 11:15	KLR	02/12/2008 12:25	CMN	1	

CERTIFICATE OF ANALYSIS

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS

Workorder 8037013 AWS-2/6/08 1510

Lab ID:	8037013002	Date Received:	2/8/2008 15:10	Matrix:	Aqueous Liquid
Sample ID:	08020059-002	Date Collected:	2/6/2008 08:20	TYPE:	NA

Analysis Desc: SM 5210 B

Preparation Method: SM 5210 B

Analytical Method: SM 5210 B

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	Qual	Re
BOD	5	mg/L	2.00	1	02/07/2008 11:15	KLR	02/12/2008 12:25	CMN		1

CERTIFICATE OF ANALYSIS

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS

Workorder 8037013 AWS-2/6/08 1510

Lab ID: 8037013003
Sample ID: 08020059-003
Date Received: 2/6/2008 15:10
Date Collected: 2/6/2008 08:45
Matrix: Aqueous Liquid
TYPE: NA

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	Qual	Re
Analysis Desc: SM 5210 B	**Preparation Method: SM 5210 B** **Analytical Method: SM 5210 B**									
BOD	288	mg/L	2.00	1	02/07/2008 11:15	KLR	02/12/2008 12:25	CMN		1

CERTIFICATE OF ANALYSIS

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS

Workorder 8037013 AWS-2/6/08 1510

Lab ID:	8037013004	Date Received:	2/6/2008 15:10	Matrix:	Aqueous Liquid
Sample ID:	08020067-002	Date Collected:	2/5/2008 11:40	TYPE:	NA

Analysis Desc: SM 5210 B

Preparation Method: SM 5210 B

Analytical Method: SM 5210 B

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	Qual	Re
BOD	48	mg/L	2.00	1	02/07/2008 11:15	KLR	02/12/2008 12:25	CMN		1

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS

Workorder 8037013 AWS-2/6/08 1510

Lab ID:	8037013005	Date Received:	2/6/2008 15:10	Matrix:	Aqueous Liquid
Sample ID:	08020069-001	Date Collected:	2/5/2008 14:00	TYPE:	NA

Analysis Desc: SM 5210 B **Preparation Method: SM 5210 B**

Analytical Method: SM 5210 B

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	Qual	Re
CBOD	<2	mg/L	2.00	1	02/07/2008 12:10	KLR	02/12/2008 13:12	CMN		2

CERTIFICATE OF ANALYSIS

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS

Workorder 8037013 AWS-2/6/08 1510

Lab ID:	8037013006	Date Received:	2/6/2008 15:10	Matrix:	Aqueous Liquid
Sample ID:	08020069-002	Date Collected:	2/5/2008 15:00	TYPE:	NA

Analysis Desc: SM 5210 B

Preparation Method: SM 5210 B

Analytical Method: SM 5210 B

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	Qual	Re
CBOD	2	mg/L	2.00	1	02/07/2008 12:10	KLR	02/12/2008 13:12	CMN		2

CERTIFICATE OF ANALYSIS

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

ANALYTICAL RESULTS QUALIFIERS

Workorder: 8037013 AWS-2/6/08 1510

PARAMETER QUALIFIERS

[1] The method blank analyzed by SM5210B exceeded the 0.20mg/L depletion criteria with 0.24mg/L.

[2] The method blank analayzed by SM5210B, CBOD, exceeded the 0.2mg/L depletion criteria with 0.27mg/L

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

Analytics

CHAIN OF COUSTODY

PAGE ____ OF ____

CLIENT NAME: AWS	PROJECT NAME:
CLIENT CONTACT: Jessica Comstock	SITE NAME:
CLIENT ADDRESS:	PROJECT NUMBER:
CLIENT PHONE NUMBER:	P.O. NUMBER:
CLIENT FAX NUMBER: EMAIL:	REGULATORY AUTHORITY:
Is sample for compliance reporting? YES NO / Is sample from a chlorinated supply? YES NO	PWS I.D. #:
SAMPLER NAME (PRINT): / SAMPLER SIGNATURE:	Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface-Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD	CBOD	~~[illegible]~~					COMMENTS Quote I.D.: PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) 08020059-001			2-6-08	~~[illegible]~~ 8:06	1					✓					✓							time = 8:06
2) 08020059-002			2-6-08	8:20	1					✓					✓							
3) 08020059-003			2-6-08	8:45	1					✓					✓							
4) 08020067-002			2-5-08	11:40	1					✓					✓							
5) 08020069-001			2-5-08	14:00	1					✓						✓						
6) 08020069-002			2-5-08	1500	1					✓						✓						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	2-6-08 14:55		2/6/08 1455
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP ______ °C

ANALYTICS

Account Name: AWS

Sample Container Receipt Form:

Sample Identification	08020059-001	08020059-002	08020059-003	08020067-002	08020069-001	08020069-002		
Type of Container	1000P	1000P	1000P	1000P	1000P	1000P		
Number of Containers	1	1	1	1	1	1		
Temperature on Arrival	8C →	→	→	→	→			
pH on Arrival	NA →	→	→	→	→			
Chlorine on Arrival (ppm)	NA →	→	→	→	→			
VOA Sample Condition								
General Condition	gd →	→	→	→	→			
	BOD	BOD	BOD	BOD	CBOD	CBOD		
Notes and comments								

P=Plastic; G=Glass, Am=Amber, VOA=VOA vial

** Samples received in __________ for VOC's in soil. See attached for details on sample containers for low level VOC's in soil.

Sample Custodian ASilberman Date 2/6/08

AIR WATER & SOIL
LABORATORIES, INC.®
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Amy Hardy
723 Woodlake Drive
Chesapeake, VA 23230

Regarding BOD analysis of sample ID "Leachate Pond", a HRSD Monthly Leachate sample, collected on Feb. 5, 2008 and received by Air, Water & Soil Laboratories, Inc. on Feb. 6, 2008:

At the time the sample in question was received by Air, Water & Soil Laboratories, the laboratory was experiencing quality control deficiencies for BOD analyses (SM5210B). As a result of these deficiencies, the management of the laboratory concluded that all BOD samples received must be subcontracted to Analytics Laboratories to ensure that all quality control requirements were fulfilled and that all sample results reported would be accurate and reliable.

As of February 19, 2008, Air, Water & Soil Laboratories has corrected all quality control issues experienced during this time frame in which this sample was received, and is currently analyzing all BOD samples in house again.

Please feel free to contact Air, Water & Soil Laboratories with any further questions regarding this matter.

Regards

Ted Soyars

Ted Soyars
Laboratory Manger
Air, Water & Soil Laboratories
804-358-8295

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LABORATORIES, INC.®
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Laboratory Order ID: 08020331

Industry Name: SPSA-LF

Event Name: RL HRSD Leachate Discharge

Laboratory Sample I.D.: 08020331-001

Customer Sample ID: CN-Leachate

Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)

Industrial Waste Code: SPSA004

Sample Point Code: 1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
CN-	0.04 mg/L	0.01	02/19/08 845	02/25/08 1034	Kelada-01	LG

Event Name: RL HRSD Leachate Discharge

Laboratory Sample I.D.: 08020331-002

Customer Sample ID: CN-Leachate

Sample Pt. Address: Nansemond Parkway

Sample Pt. Location: Discharge side of the #1 (Leachate Pond)

Industrial Waste Code: SPSA004

Sample Point Code: 1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
CN-	0.03 mg/L	0.01	02/20/08 910	02/25/08 1034	Kelada-01	LG

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted

Name: Ted Soyars

Title: Laboratory Manager

Date Issued: 2/28/2008

AIR WATER SOIL LABORATORIES, INC.

2109A NORTH HAMIL J STREET
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(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME:	SPSA	PROJECT NAME:	Regional LF HRSD Monthly Leachate
CLIENT CONTACT:	Amy Hardy	SITE NAME:	RL HRSD Leachate Discharge
CLIENT ADDRESS:	1 Bob Foeller Dr., Suffolk, VA 23434	PROJECT NUMBER:	
CLIENT PHONE NUMBER:	(757) 539-9373 x 7	P.O. NUMBER:	4500031018
CLIENT FAX NUMBER:	(757) 539-9379 EMAIL: ahardy@spsa.com	REGULATORY AUTHORITY:	

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES ~~NO~~

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS: ~~Cu,Cr,Zn,Pb,Ni,Cd,Hg,As (HNO3)~~	~~BOD~~	~~Phenolics (H2SO4)~~	CN⁻ 250ml PLASTIC NaOH				COMMENTS 2-19-08 FLOW EST@ 0842 2-20-08 FLOW EST@ 0905 ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) CN-LEACHATE			2-19-08	0845	1	✓				✓								1				
2) CN-LEACHATE			2-20-08 ~~2-20-08~~ CW	0910	1	✓				✓								1				
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	2-21-08/1500	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			2-22-08 14:10
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐

5 °C

08020331

SPSA-LF 08020331
RL HRSD Leachate Discharge DUE: 5 Days
Recd: 02/22/08

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08020331

SPSA-LF **08020331**
RL HRSD Leachate Discharge DUE: 5 Days
Recd: 02/22/08

Sample Conditions Checklis

Opened by: (print) A. McGinley **Lab ID No.:** ______

(sign) A. McGinley **Date Cooler Opened:** 2-22-08

1. How were samples received?
   - Fed Ex ☐
   - UPS ☐
   - Courier ☑
   - Walk In ☐

		YES	NO	N/A
2.	Were custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all bottle labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 degrees Celsius +/-2)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month February Year 2008

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1*	1437962	31962	17	2099448	0
2	1531095	0	18	2099448	0
3	1531095	0	19*	2231674	132226
4*	1531095	93133	20*	2409642	177968
5*	1575481	44386	21*	2590564	180922
6*	1701097	125616	22*	2765337	174773
7*	1777278	76184	23	2765337	0
8*	1861572	84294	24	2765337	0
9	1861572	0	25*	2798445	33108
10	1861572	0	26*	2837082	38637
11	1861572	0	27*	2975829	138747
12*	1903672	42100	28	2975829	0
13*	1962849	59177	29*	3012311	36482
14*	2008373	45524			
15*	2099448	91075			
16	2099448	0			

Monthly Total: 1606314 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name (print): Amy E. Hardy
Name (signature): Amy E Hardy
Title: Environmental Compliance Coordinator
Date: 3-7-07

Printed EMS forms are uncontrolled

Check EMS website for current form.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 2/05/2008 @ 0902
Date / Time

Flow Secured: 2/05/2008 @ 1139
Date / Time

pH Meter: Beckman Model 255

Calibration: 2/05/2008 @ 0810
Date / Time

Buffer Solutions: 4.00 (Result) 4.00 | 7.01 (Result) 7.00 | 10.04 (Result) 10.00

Slope: 101.6

Calibration Verification: 8.00/7.97
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 2/05/2008 @ 0905
Date / Time

pH Result: 7.73 @ 16.8 C

Time of Analysis: 0908

Phenols Interference Check: Pos
(Positive or Negative)

0910
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: 2/05/2008 @ 0903
Date / Time

Composite Stop: 2/05/2008 @ 1140
Date / Time

Comments: Added FAS to total absorption, but could not remove interference.

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	AMENDED February 2008
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed March 21, 2008
Number of Pages:	3

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Regional Landfill	0087 Acct# 4178540009	2-5-08 Monthly leachate: Monthly pH and Phenols/ Air, Water, & Soil Laboratories COC	None

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name: Southeastern Public Service Authority
Sample Point Address: #1 Bob Foeller Drive, Suffolk, VA.
Location: Regional Landfill (Permit # 0087)

Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.7	SU	----	02-05-08 09:05	02-05-08 09:08	SM 4500-HB	CEW
Total Phenols	----	mg/l	0.021	02-05-08 09:05	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy
Date: 3/21/08

AIR WATER SOIL LABORATORIES, INC.

RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

LIENT NAME:	SPSA	PROJECT NAME:	HRSD Monthly Leachate
LIENT CONTACT:	Amy Hardy	SITE NAME:	SPSA Regional Landfill
LIENT ADDRESS:	1 Bob Foeller Dr., Suffolk, VA 23434	PROJECT NUMBER:	
LIENT PHONE NUMBER:	(757) 539-9373 x 7	P.O. NUMBER:	4500031018
LIENT FAX NUMBER:	(757) 539-9379 EMAIL: ahardy@spsa.com	REGULATORY AUTHORITY:	

s sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

AMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

ave ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS: Cu,Cr,Zn,Pb,Ni,Cd,Hg,As (HNO3)	BOD	Phenolics (H2SO4)	COD H2SO4	CN- NaOH			COMMENTS: PH CALC@ 0810 PH GRAB@ 0905 PH= 7.73@0908 TEMP= 16.8°C FLOWEST@ 903 FLOWSECURED@ 1139 COMPOSITE POURED @ 1143 PHENOLS GRABED @ 0905 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			2-5-08	1133	1	✓				✓									1			PHENOLS POS
2) LEACHATE POND	2-5-08	0903	2-5-08	1140	3		✓			✓					1	1		1				@ 0910 ADDED
3)																						FAS TO TOTAL
4)																						AS PORTION
5)																						BUT COULD
6)																						NOT REMOVE
7)																						INTERFERENCE
8)																						
9)																						
10)																						

ELINQUISHED:	DATE / TIME 2-5-08/1420	RECEIVED: COURIER	DATE / TIME
ELINQUISHED:	DATE / TIME	RECEIVED: A McBenny	DATE / TIME 2-6-08 12:55
ELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 2.1 °C

SPSA-LF
HRSD Monthly Leachate

08020067
DUE: 5 Days
Recd: 02/06/08

y Leachate

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
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Regional Office
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phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	January 2008 **(AMENDED)**
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed March 3, 2008
Number of Pages:	4

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Regional Landfill	0087 Acct# 4178540009	Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA	None

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

Certification Statement

For Reports or Information Submitted to HRSD

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Signature: Amy E. Hardy
Title: Environmental Compliance Coordinator
Date: 3-4-08

AIR WATER & SOIL
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Laboratory Order ID: 08010025

Industry Name: SPSA-LF
Sample Pt. Address: Monthly HRSD Leachate
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 08010025-001

Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.2 SU	--	01/02/08 1012	01/02/08 1014	SM4500-H B	Client
Phenols	0.87 mg/L	0.05	01/02/08 1012	01/08/08 945	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he bmitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nf ation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 2/25/2008

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LABORATORIES, INC.®
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Laboratory Order ID: 08010025

Industry Name: SPSA-LF
Sample Pt. Address: Monthly HRSD Leachate
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 08010025-002
Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	37.6 mg/L	2.0	01/02/08 1009	01/02/08 1421	01/08/08 1555	SM5210B	LG & VLG
	The GGA exhibited low recovery.						
Cu	0.042 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Cr	0.020 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Zn	0.143 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
P	0.014 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Ni	0.077 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
As	0.044 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	01/02/08 1009	01/02/08 1421	01/08/08 1037	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 2/25/2008

AIR WATER SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
Is sample for compliance reporting? [✓ YES] NO

PROJECT NAME: MONTHLY HRSD LEACHATE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX							ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H_2SO_4	BOD 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500 ml PLASTIC HNO_3					Quote I.D.: PH CAL@0934 PH= 7.15@1014 TEMP= 9.3°C FLOW ESTD 1008 FLOW SECURED@ 1417 PHENOLS POS. FOR INTERFERENCE @ 1018 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND		CW	1-2-08 ~~[illegible]~~	1012	1	✓				✓					1							Remove c̄
2) LEACHATE POND	1-02-07	1009	1-2-08 ~~[illegible]~~ CW	1421	2		✓			✓						1	1					FAS PROCEED
3)																						c̄ ANALYSIS
4)																						
5)																						COMPOSITE
6)																						POURED @ 1421
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles	1-2-07/1435	COURIER	
		H. McJunney	1-3-08 12:53

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 0.3 C
08010025
SPSA-LF
Monthly HRSD Leachate
08010025
DUE: 5 Days
Recd: 01/03/08
ls

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 01/02/2008 @ 1008
Date / Time

Flow Secured: 01/02/2008 @ 1417
Date / Time

pH Meter: Beckman Model 255

Calibration: 01/02/2008 @ 0934
Date / Time

Buffer Solutions: 4.00 (Result) 4.00 7.07 (Result) 7.00 10.05 (Result) 10.00

Slope: 98.5

Calibration Verification: 8.00/8.00
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 01/02/2008 @ 1012
Date / Time

pH Result: 7.15 @ 9.3 C

Time of Analysis: 1014

Phenols Interference Check: Positive
(Positive or Negative)

1018
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **01/02/2008 @ 1009**
Date / Time

Composite Stop: **01/02/2008 @ 1418**
Date / Time

Comments: Composites poured @ 1421. Added FAS to phenols to remove interference.

SOUTHEASTERN PUBLIC SERVICE AUTHORITY SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	January 2008
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed February 8, 2008
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station Account No. 3473040009

Service Location 3136 Woodland Drive City Norfolk

Circle One

Meter S/N 99824707 Date Read 1/31/08 Reading* 330320 CF [✓ GAL]

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy **Title** Environmental Compliance Coordinator
(printed)

Signature Amy E Hardy **Date** 2-8-08

Revised 06/11/07

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month January Year 2008

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	497953	126757	17	834002	44151
2	497953	0	18	899906	65904
3	497953	0	19	899906	0
4	579389	81436	20	899906	0
5	579389	0	21	899906	0
6	579389	0	22	1018219	118313
7	579389	0	23	1120079	101860
8	579389	0	24	1192118	72039
9	579389	0	25	1279896	87778
10	579389	0	26	1279896	0
11	658617	79228	27	1279896	0
12	740815	82198	28	1319198	39302
13	740815	0	29	1319198	0
14	740815	0	30	1361701	42503
15	772975	32160	31	1406000	44299
16	789851	16876			

Monthly Total: 1034804 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name (print): Amy E. Hardy
Name (signature): Amy E. Hardy
Title: Environmental Compliance Coordinator

Date: 2-8-08

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LABORATORIES, INC.®
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Laboratory Order ID: 08010025

Industry Name: SPSA-LF
Sample Pt. Address: Monthly HRSD Leachate
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 08010025-001

Industrial Waste Code: SPSA 004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.2 SU	--	01/02/08 1012	01/02/07 1014	SM4500-H B	Client
Phenols	0.87 mg/L	0.05	01/02/08 1012	01/08/08 945	EPA420.1	RPF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 1/10/2008

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Laboratory Order ID: 08010025

Industry Name: SPSA-LF
Sample Pt. Address: Monthly HRSD Leachate
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 08010025-002

Industrial Waste Code: SPSA 004
Sample Point Code: #1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	37.6 mg/L	2.0	01/02/08 1009	01/02/08 1421	01/08/08 1555	SM5210B	LG & VLG
	The GGA exhibited low recovery.						
Cu	0.042 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Cr	0.020 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Zn	0.143 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
	0.014 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Ni	0.077 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
As	0.044 mg/L	0.010	01/02/08 1009	01/02/08 1421	01/04/08 1448	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	01/02/08 1009	01/02/08 1421	01/08/08 1037	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 1/10/2008

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379

PROJECT NAME: MONTHLY HRSD LEACHATE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H2SO4	BOD 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500 ml PLASTIC HNO3					Quote I.D.: pH CAL @ 0934 pH = 7.15 @ 1014 TEMP = 9.3°C FLOW EST'D 1008 FLOW SECURED @ 1417 PHENOLS POS. FOR INTERFERENCE @ 1018 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-02-07	1012	1	✓				✓					1							Remove c̄
2) LEACHATE POND	1-02-07	1009	1-02-07	1421	2		✓			✓						1	1					FAS Proceed
3)																						c̄ ANALYSIS
4)																						
5)																						Composite
6)																						Poured @ 1421
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-2-07 / 1435	COURIER	
			1-3-08 12:53

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 0.3 °C

SPSA-LF
Monthly HRSD Leachate
08010025

08010025
DUE: 5 Days
Recd: 01/

AIR WATER & SOIL Laboratories, Inc.

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08010025

SPSA-LF

Monthly HRSD Leachate

08010025

DUE: 5 Days
Recd: 01/03/08

Sample Conditions Ch

Opened by: (print) Ashley McGinney **Lab ID No.:**

(sign) Ashley McGinney **Date Cooler Opened:** 1-3-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☐	☑	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	January 2008
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	January 25, 2008
Certified Reports:	Mailed January 25, 2008
Number of Pages:	8

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Regional Landfill	0087	Cyanide Samples	Not Applicable

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 1/25/08

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
Phone: (757) 420-4700; Fax: (757) 424-4133
www.spsa.com

January 25, 2008

Ms. Christel Dyer
Hampton Roads Sanitation District
P.O. Box 5902
Virginia Beach, VA 23471-0902

RE: Southeastern Public Service Authority (SPSA)
Regional Landfill, Permit No. 0087

Dear Ms. Dyer:

Please see attached sampling data for Cyanide and COD collected at the above-referenced facility. On January 9, 2008 you recommended SPSA personnel collect additional samples of Cyanide from our permitted sampling point at the leachate settlement pond. This was due to a potential daily maximum exceedance from the sample collected on January 2, 2008, by HRSD personnel. From January 15 to 18 and on January 22, 2008, SPSA personnel collected five samples to analyze for Cyanide and four samples to analyze COD. COD was collected to compare with HRSD's samples taken on December 3 and 10, 2007, which resulted in values of 1000 and 1010 ppm respectively.

The COD values, in order of the date they were taken, are as follows: 787, 761, 784, and 754 ppm. The Cyanide values, in order of the date they were taken, are as follows: 0.20, 0.21. 0.20, 0.15, and 0.13 ppm. Using the validated HRSD Cyanide exceedance of 1.21 ppm from January 2, 2008 and the additional SPSA sampling data, an average of 0.35 ppm was calculated. This value is below the permitted monthly calendar average threshold of 0.5 ppm.

If you have any questions, please contact me at (757) 539-9373, ext. 7.

Sincerely,

Amy E. Hardy

Amy E. Hardy
Environmental Compliance Coordinator

Attachments

cc: Mr. Scott Whitehurst

P.O. Box 1346
Chesapeake, VA 23320-1346

Certification Statement

For Reports or Information Submitted to HRSD

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E. Hardy
Date: 1-25-08

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Certificate of Analysis

Final Report

Laboratory Order ID 08010211

Client Name: SPSA-LF
723 Woodlake Drive
Chesapeake, VA 23320

Date Received: January 16, 2008
Date Issued: January 24, 2008

Submitted To: Amy Hardy

Project Number: NA

Client Site I.D.: CN Leachate Resample

Purchase Order: 4500024514

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010211-001

Date/Time Sampled: 01/15/08 09:15

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.20 mg/L	0.01	01/24/08 10:45	LG

Ted Soyars
Laboratory Manager

AIR WATER & SOIL
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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: CN LEACHATE RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379 EMAIL:	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles L. [illegible]
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX							ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN- 250ml PLASTIC NaOH							Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-15-08	0915	1	✓				✓					1							
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles L. [illegible]	1-15-08/1500	COURIER	
		A. McKinney	1-16-08 14:1

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 1.2 °C

SPSA-LF
08010211
CN Leachate Resample
DUE: 5 Days
Recd: 01/16/08
08010211

AWS COC_v071214.xls

AIR WATER SOIL Laboratories, Inc.

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Sample Conditions Che

08010211

SPSA-LF **08010211**
CN Leachate Resample
DUE: 5 Days
Recd: 01/16/08

Opened by: (print) A. McGinley

Lab ID No.:

(sign) A. McGinley

Date Cooler Opened: 1-16-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☒ AKM	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☒
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010245

Client Name: SPSA-LF
723 Woodlake Drive
Chesapeake, VA 23320

Date Received: January 17, 2008
Date Issued: January 24, 2008

Submitted To: Amy Hardy

Project Number: NA

Client Site I.D.:

Purchase Order: 4500024514

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010245-001

Date/Time Sampled: 01/16/08 09:15

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.21 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	787 mg/L	10.0	01/23/08 10:02	RPF

fr Ted Soyars
Laboratory Manager

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: CN^- + COD LEACHATE RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN^- 250 ml PLASTIC NaOH	COD 250 ml PLASTIC						Quote I.D.: ALL SAMPLES TRANSPORTED TO LPB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-16-08	0915	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles C. Will	1-16-08 / 1305	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			1-17-08 13:58
RELINQUISHED	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 2.2 °C

08010245

SPSA-LF

08010245

DUE: 5 Days

Recd: 01/17/

ds

AIR WATER & SOIL Laboratories, Inc.

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Sample Conditions Cl

08010245

SPSA-LF **08010245**

DUE: 5 Days
Recd: 01/17/08

Opened by: (print) A. McGinney

(sign) A. McGinney

Lab ID No.:

Date Cooler Opened: 1-17-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010267

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 18, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	CN & COD Leachate Resample	Purchase Order:	4500024514

Sample I.D.: Leachate Pond
Laboratory Sample I.D.: 08010267-001
Date/Time Sampled: 01/17/08 09:36

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.20 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	761 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

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(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: DPDA	PROJECT NAME: CN⁻ + COD LEACHATE RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 X7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT):

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	MATRIX: Waste Water / Storm Water	MATRIX: Drinking Water	MATRIX: Soil	MATRIX: Solids	MATRIX: Other	ANALYSIS: CN⁻ 250ml PLASTIC NaOH	ANALYSIS: COD 250ml PLASTIC H_2SO_4	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	COMMENTS: Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-17-08	0936	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-17-08 /1910	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			1-18-08 13:00
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 2.6 °C

SPSA-LF 08010267
CN & COD Leachate Resampl
DUE: 5 Days
Recd: 01/18/08

I29.xls

AIR WATER SOIL
Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel : (

SPSA-LF **08010267**
CN & COD Leachate Resampl DUE: 5 Days
Recd: 01/18/08

Sample Conditions Che

Opened by: (print) A. McGinney

(sign) A. McGinney

Lab ID No.: ____________

Date Cooler Opened: 1-18-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010266

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 18, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	CN & COD Leachate Resample	Purchase Order:	4500024514

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010266-001

Date/Time Sampled: 01/18/08 09:04

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.15 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	784 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: CN- + COD LEACHATE RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX							ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN- 250ml PLASTIC NaOH	COD 250ml PLASTIC H2SO4						Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-18-08	09 04	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						ON ICE
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-18-08/0925	COURIER	
			1-18-08 12:48

QC Data Package
Level I ☐
Level II ☐
Level III ☐

LAB USE ONLY

COOLER TEMP 2.5 °C

SPSA-LF
CN & COD Leachate Resampl
08010266
DUE: 5 D
Recd: 01/18
08010266

AIR WATER & SOIL Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel : (

Sample Conditions Che

08010266

SPSA-LF **08010266**
CN & COD Leachate Resampl
DUE: 5 Days
Recd: 01/18/08

Opened by: (print) A. McGinny

Lab ID No.:

(sign) A McGinny

Date Cooler Opened: 1-18-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010318

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 23, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	Leachate Pond CN+COD Resample	Purchase Order:	4500031018

Sample I.D.: Leachate Pond
Date/Time Sampled: 01/22/08 08:32

Laboratory Sample I.D.: 08010318-001

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.13 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	754 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA
CLIENT PHONE NUMBER: 1-757-539-9373 x7
CLIENT FAX NUMBER: 1-757-539-9379
PROJECT NAME: LEACHATE POND CN+COD RESAMPLE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles E.
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN⁻ 250ml PLASTIC NaOH	COD 250ml PLASTIC H_2SO_4						Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE FLOW ESTD 0830 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-22-08	0832	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles Williams	1-22-08/1225	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED: A. McBurney	DATE / TIME 1-23-08 12:05
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 4.2 °C

08010318
SPSA-LF 08010318
Leachate Pond CN+COD Resa DUE: 5 Days
Recd: 01/23/(

ds

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SPSA-LF **08010318**
Leachate Pond CN+COD Resa DUE: 5 Days
Recd: 01/23/08

08010318

Sample Conditions Chec

Opened by: (print) A. McGinley

Lab ID No.:

(sign) A. McGinley

Date Cooler Opened: 1-23-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☐	☑	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

TRANSMISSION VERIFICATION REPORT

TIME : 01/25/2008 12:13
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	01/25 12:11
FAX NO./NAME	4643985
DURATION	00:01:53
PAGE(S)	08
RESULT	OK
MODE	STANDARD ECM

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Certificate of Analysis

Final Report

Laboratory Order ID 08010211

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 16, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	CN Leachate Resample	Purchase Order:	4500024514

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010211-001

Date/Time Sampled: 01/15/08 09:15

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.20 mg/L	0.01	01/24/08 10:45	LG

Ted Soyars

Ted Soyars

Laboratory Manager

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9377
EMAIL:
PROJECT NAME: CN LEACHATE RESAMPLE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	MATRIX: Waste Water / Storm Water	MATRIX: Drinking Water	MATRIX: Soil	MATRIX: Solids	MATRIX: Other	ANALYSIS: CN⁻ 250ml Plastic NaOH	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	ANALYSIS	COMMENTS: Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-15-8	0915	1	✓				✓					1							
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-15-8/1500	COURIER	
		A. McKinney	1-16-08 14:1

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 1.2 °C

08010211
SPSA-LF
CN Leachate Resample
08010211
DUE: 5 Days
Recd: 01/16/08

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08010211

SPSA-LF **08010211**
CN Leachate Resample
DUE: 5 Days
Recd: 01/16/08

Sample Conditions Che

Opened by: (print) A. McGinley **Lab ID No.:**

(sign) A. McGinley **Date Cooler Opened:** 1-16-08

		YES	**NO**	**N/A**
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☒ AKM	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☑
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010245

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 17, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:		Purchase Order:	4500024514

Sample I.D.: Leachate Pond
Laboratory Sample I.D.: 08010245-001
Date/Time Sampled: 01/16/08 09:15

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.21 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	787 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
PROJECT NAME: CN^- + COD LEACHATE RESAMPLE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024614
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: 5 Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	MATRIX Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS CN^- 250 ml PLASTIC NaOH	COD 250 ml PLASTIC						COMMENTS Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-16-08	0915	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles C. Will	1-16-08/1305	COURIER	
			1-17-08 1358

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 2.2 °C
08010245
SPSA-LF
08010245
DUE: 5 D
Recd: 01/1
ds

AIR WATER & SOIL Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Te

08010245

SPSA-LF **08010245**

DUE: 5 Days
Recd: 01/17/08

Sample Conditions Cl

Opened by: (print) A. McGinley

Lab ID No.:

(sign) A. McGinley

Date Cooler Opened: 1-17-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010267

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 18, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	CN & COD Leachate Resample	Purchase Order:	4500024514

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010267-001

Date/Time Sampled: 01/17/08 09:36

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.20 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	761 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

AIR WATER & SOIL LABORATORIES, INC.

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: OPDA
CLIENT CONTACT: Amy HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379

PROJECT NAME: CN⁻ + COD LEACHATE RESAMPLE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT):
SAMPLER SIGNATURE:
Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX							ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN⁻ 250ml PLASTIC NaOH	COD 250ml PLASTIC H2SO4						Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-17-08	0936	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-17-08 / 1910	COURIER	
			1-18-08 13:00

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 2.0 °C

SPSA-LF
CN & COD Leachate Resampl
08010267
DUE: 5 Day
Recd: 01/18/0

129.xls

AIR WATER & SOIL Laboratories, Inc.

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SPSA-LF **08010267**
CN & COD Leachate Resampl DUE: 5 Days
Recd: 01/18/08

Sample Conditions Che

Opened by: (print) A. McGinny

(sign) A. McGinny

Lab ID No.: ____________________

Date Cooler Opened: 1-18-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

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Certificate of Analysis

Final Report

Laboratory Order ID 08010266

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	January 18, 2008 January 24, 2008
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	CN & COD Leachate Resample	Purchase Order:	4500024514

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010266-001

Date/Time Sampled: 01/18/08 09:04

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.15 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	784 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

AIR WATER SOIL LABORATORIES, INC.

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(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: CN^- + COD LEACHATE RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x 7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: 5 Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN^- 250ml PLASTIC NaOH	COD 250ml PLASTIC H_2SO_4						COMMENTS: Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-18-08	0904	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						on ice
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-18-08/0925	COURIER	
			1-18-08 12:48

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐
- Level IV ☐

LAB USE ONLY

COOLER TEMP 2.5 °C

08010266

SPSA-LF

CN & COD Leachate Resampl

08010266

DUE: ays

Recd: 0 d/08

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WATER & SOIL
Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel : (

08010266

SPSA-LF **08010266**
CN & COD Leachate Resampl DUE: 5 Days
Recd: 01/18/08

Sample Conditions Che

Opened by: (print) A. McGinny

Lab ID No.:

(sign) A McGinny

Date Cooler Opened: 1-18-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☑	☐	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

AIR WATER & SOIL
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Certificate of Analysis

Final Report

Laboratory Order ID 08010318

Client Name: SPSA-LF
723 Woodlake Drive
Chesapeake, VA 23320

Date Received: January 23, 2008
Date Issued: January 24, 2008

Submitted To: Amy Hardy

Project Number: NA

Client Site I.D.: Leachate Pond CN+COD Resample

Purchase Order: 4500031018

Sample I.D.: Leachate Pond

Laboratory Sample I.D.: 08010318-001

Date/Time Sampled: 01/22/08 08:32

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.13 mg/L	0.01	01/24/08 10:45	LG
COD	EPA410.4	754 mg/L	10.0	01/23/08 10:02	RPF

Ted Soyars
Laboratory Manager

AIR WATER SOIL
LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: LEACHATE POND CN+COD RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 1-757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 1-757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	CN^- 250ml PLASTIC NaOH	COD 250ml PLASTIC H2SO4						COMMENTS Quote I.D.: ALL SAMPLES TRANSPORTED TO LAB ON ICE FLOW ESTD 0830 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			1-22-08	0832	2	✓				✓					1	1						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	1-22-08/1225	COURIER	
		A. McBurney	1-23-08 12:05

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 4.2 °C

08010318

SPSA-LF 08010318
Leachate Pond CN+COD Resa DUE: 5 Days
Recd: 01/2

ds

AIR WATER & SOIL Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel : (80

SPSA-LF **08010318**
Leachate Pond CN+COD Resa DUE: 5 Days
Recd: 01/23/08
08010318

Sample Conditions Chec

Opened by: (print) A. McGinley

(sign) A. McGinley

Lab ID No.: ______

Date Cooler Opened: 1-23-08

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☐	☑	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	December 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed January 8, 2008
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station Account No. 3473040009

Service Location 3136 Woodland Drive City Norfolk

Circle One

Meter S/N 99824707 Date Read 01/07/08 Reading* 328250 CF [✓ GAL]

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy **Title** Environmental Compliance Coordinator
(printed)

Signature Amy E. Hardy **Date** 1-7-08

Revised 06/11/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name: Southeastern Public Service Authority
Sample Point Address: #1 Bob Foeller Drive, Suffolk, VA.
Location: Regional Landfill (Permit # 0087)

Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.52	-----	<5.0	12-10-07 09:36	12-10-07 09:38	EPA 4500-H^+B	CEW
Total Phenols	----	mg/l	0.021	12-10-07 09:36	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E. Hardy
Date: 1/7/08

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Laboratory Order ID: 07120141

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07120141-001

Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	31.4 mg/L	2.0	12/10/07 935	12/10/07 1410	12/17/07 1605	SM5210B	RPF
Cu	0.037 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
Cr	0.021 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
Zn	0.154 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
[illegible]	0.066 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
As	0.029 mg/L	0.010	12/10/07 935	12/10/07 1410	12/13/07 1626	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	12/10/07 935	12/10/07 1410	12/14/07 1115	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 12/28/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07120141

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07120141-002

Industrial Waste Code: SPSA004
Sample Point Code: #1

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.5 SU	--	12/10/07 938	12/10/07 938	SM4500-H B	Client

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false [illegible]mation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 12/28/2007

AIR WATER SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR. SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 X7
CLIENT FAX NUMBER: 757-539-9379
PROJECT NAME: HRSD MONTHLY LEACHATE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: 10 Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	METALS (As, Cr, Cd, Cu, Pb, Hg, Zn, Ni) HNO3 500ml PLASTIC						COMMENTS Quote I.D.: PH CAL@0910 PH= 7.52@0938 TEMP=13.9 FLOW START@ 0932 FLOWSECURED@ 1410 PHENOLS POS@ 0942 ADDED FAS TO TOTAL ABSORPTION COULD NOT REMOVE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	12-10-07	0935	12-10-07	1410	2		✓			✓					1	1						INTERFERENCE
2)																						DO NOT ANALYSIS
3)																						
4)																						SAMPLES POURED
5)																						@1415
6)																						
7)																						ALL SAMPLES
8)																						TRANSPORTED
9)																						TO LAB ON ICE
10)																						1.9°C

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	12-10-07/1445	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			12/11/07 1208
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP °C

SPSA-LF
Regional Landfill

07120141
DUE: 10 Days
Recd: 12/12/07

070329.xls

AIR WATER & SOIL
Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel : (804) 358-829

SPSA-LF
Regional Landfill

07120141
DUE: 10 Days
Recd: 12/12/07

Sample Conditions Checklist

Opened by: (print) G W

(sign)

Lab ID No.: —

Date Cooler Opened: 12

		YES	NO	N/A
1.	Are the samples relinquished by sampler?	☐	☑	☐
2.	If not, are custody seals used?	☐	☑	☐
3.	If yes, are custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
4.	Are the custody papers filled out completely and correctly?	☑	☐	☐
5.	Do all container labels agree with custody papers?	☑	☐	☐
6.	Are the samples received on ice?	☑	☐	☐
7.	Is the temperature blank or representative sample within acceptable limits? (4 ± 2 °C)	☑	☐	☐
8.	Are all samples within holding time for requested tests?	☑	☐	☐
9.	Is a sufficient amount of sample provided to perform the tests indicated?	☑	☐	☐
10.	Are all samples in proper containers for the analyses requested?	☑	☐	☐
11.	Are all samples appropriately preserved for the analyses requested?	☑	☐	☐
12.	Are all volatile organic containers free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month DEC. Year 2007

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	7635299	0	17	8072605	84243
2	7635299	0	18	8072605	0
3	7715560	80261	19	8161903	89298
4	7715560	0	20	*5378	5378
5	7793649	78089	21	63827	58449
6	7793649	0	22	63827	0
7	7841645	47996	23	63827	0
8	7841645	0	24	63827	0
9	7841645	0	25	63827	0
10	7926120	84475	26	163494	99667
11	7926120	0	27	163494	
12	7926120	0	28	287411	123917
13	7926120	0	29	371196	83785
14	7988362	62242	30	371196	0
15	7988362	0	31	371196	0
16	7988362	0			

Monthly Total: 897600 Gallons

NEW METER INSTALLED ON 12-20-07

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. §1319. (Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.

Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 1-7-08

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

TRANSMISSION VERIFICATION REPORT

TIME : 01/08/2008 08:46
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	01/08 08:44
FAX NO./NAME	4643985
DURATION	00:01:41
PAGE(S)	05
RESULT	OK
MODE	STANDARD ECM

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 12/10/2007 @ 0932
Date / Time

Flow Secured: 12/10/2007 @ 1410
Date / Time

pH Meter: Beckman Model 255

Calibration: 12/10/2007 @ 0810
Date / Time

Buffer Solutions:	4.00 4.00	7.02 7.00	10.04 10.00
	Result	Result	Result

Slope: 98.2

Calibration Verification: 8.00/8.01
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 12/10/2007 @ 0936
Date / Time

pH Result: 7.52 @ 13.9 C

Time of Analysis: 0938

Phenols Interference Check: Positive
(Positive or Negative)

0942
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **12/10/2007 @ 0935**
Date / Time

Composite Stop: **12/10/2007 @ 1410**
Date / Time

Comments: Added FAS to total absorption but could not remove interference.

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Report for:	July – December 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed December 10, 2007
Number of Pages:	12

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report/Parameters	Violations to Report
Regional Landfill	0087 Acct# 4178540009	Semi-Annual TO Leachate Analysis	None

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 12/10/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, x7

AIR WATER & SOIL
LABORATORIES, INC.
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 07110025

Client Name: SPSA-LF
723 Woodlake Drive
Chesapeake, VA 23320

Date Issued: December 10, 2007

Submitted To: Amy Hardy

Client Site I.D.: Regional Landfill

Project Number NA

Purchase Order 4500031018

Laboratory Sample ID	Sample ID	Sample Date	Receive Date
07110025-001	Leachate Pond	October 31, 2007	November 01, 2007

On November 01, 2007, one water sample was received via courier for analysis per the attached Chain-Of-Custody. The sample was received with sample containers intact by Georgianna Wenrich (AWS). Upon laboratory receipt, no deviations, discrepancies or irregularities were observed in sample condition, including holding times, temperature, containers or preservatives other than those notated on the chain-of-custody.

The sample was prepared and analyzed in accordance with EPA/SW-846 methodology. All spike and surrogate recoveries were accomplished within acceptable Quality Control Limits as specified per the listed methodology.

The certificate of analysis was re-issued on December 10, 2007 to include 2-Chloronaphthalene which was left off the origional, November 15, 2007 submission.

Ted Soyars
Laboratory Manager

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
Acrolein	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Acrylonitrile	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chloromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Vinyl chloride	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Bromomethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Cl[illegible]ethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Trichlorofluoromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1-Dichloroethylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Methylene chloride	< 20 ug/L	20.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
trans-1,2-Dichloroethylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1-Dichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chloroform	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1,1-Trichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Carbon tetrachloride	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Benzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,2-Dichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Trichloroethylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,2-Dichloropropane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Bromodichloromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
2-Chloroethyl vinyl ether	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
cis[illegible]3-Dichloropropene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Toluene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB

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Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
trans-1,3-Dichloropropene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1,2-Trichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Tetrachloroethylene (PCE)	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
D[illegible]nochloromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Ethylbenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
m,p-Xylenes	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
o-Xylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Xylenes, Total	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Bromoform	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1,2,2-Tetrachloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,3-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,4-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,2-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Methyl ethyl ketone	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/09/07 1952	SW8260B	DMB
Methyl isobutyl ketone	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/09/07 1952	SW8260B	DMB
p-Chloro-m-cresol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2-Chloronaphthalene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2-Chlorophenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dichlorophenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dimethylphenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV

Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
4,6-Dinitro-2-methylphenol	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dinitrophenol	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2-Nitrophenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4-Nitrophenol	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
P[illegible]chlorophenol	< 20 ug/L	20.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Phenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4,6-Trichlorophenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Acenaphthene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Acenaphthylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Anthracene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (a) anthracene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (b) fluoranthene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (k) fluoranthene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (g,h,i) perylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (a) pyrene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4-Bromophenyl phenyl ether	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Butyl benzyl phthalate	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
bis (2-Chloroethoxy) methane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
bi[illegible]Chloroethyl) ether	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV

Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
bis (2-Chloroisopropyl) ether	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4-Chlorophenyl phenyl ether	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Chrysene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Dibenz (a,h) anthracene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Di-n-butyl phthalate	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,2-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,3-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,4-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Diethyl phthalate	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Dimethyl phthalate	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dinitrotoluene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,6-Dinitrotoluene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Di-n-octyl phthalate	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
bis (2-Ethylhexyl) phthalate	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Fluoranthene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Fluorene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachlorobutadiene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachlorocyclopentadiene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV

Laboratory Order ID: 07110025

Industry Name:	SPSA-LF		
Sample Pt. Address:	Regional Landfill		
Sample Pt. Location:	Leachate Pond	Laboratory Sample I.D.:	07110025-001
Industrial Waste Code:			
Sample Point Code:			
Sampled By:	Charles E. Williams		

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
Indeno (1,2,3-cd) pyrene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Isophorone	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Naphthalene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Nitrobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
N-Nitrosodimethylamine	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
N-Nitrosodiphenylamine	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
N-Nitrosodi-N-propylamine	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Phenanthrene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Pyrene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,2,4-Trichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzidine	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
3,3-Dichlorobenzidine	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,2-Diphenylhydrazine	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,3,4,6-Tetrachlorophenol	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4,4-DDD	< 0.1 ug/L	0.100	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
4,4-DDE	< 0.04 ug/L	0.040	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
4,4-DDT	< 0.01 ug/L	0.010	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Aldrin	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
al -BHC	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
beta-BHC	< 0.05 ug/L	0.050	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Chlordane	< 0.2 ug/L	0.20	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW

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Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
delta-BHC	< 0.05 ug/L	0.050	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Dieldrin	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endosulfan I	< 0.1 ug/L	0.100	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endosulfan II	< 0.04 ug/L	0.040	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endosulfan sulfate	< 0.01 ug/L	0.010	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endrin	< 0.1 ug/L	0.100	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endrin aldehyde	< 0.2 ug/L	0.200	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
gamma-BHC (Lindane)	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Heptachlor	< 0.05 ug/L	0.050	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Heptachlor epoxide	< 0.2 ug/L	0.200	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Methoxychlor	< 2 ug/L	2.000	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Toxaphene	< 3 ug/L	3.00	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1016	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1221	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1232	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1242	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1248	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1254	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1260	< 1 ug/L	1.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW

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Laboratory Order ID: 07110025

Industry Name: SPSA-LF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: fr Ted Soyars
Title: Laboratory Manager

Date Issued: 12/10/2007

AIR WATER & SOIL LABORATORIES, INC.

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: HRSD SEMI - ANNUAL TOXIC ORGANICS
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS: 624 VOLATILES 40ml-VIALS HCl	624 VOLATILES AMBER LITER ICE	608 PESTICIDES AMBER LITER ICE					COMMENTS: Quote I.D.: pH CAL@0808 pH = 6.98@0903 TEMP = 14.3°C FLOW STARTED 0855 FLOW ENDED @1530 SEMI ANNUAL SAMPLES POURED @0900, 1100, 1300, 1535 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	10-31-07	0854	10-31-07	1530	10		✓			✓					8	1	1					ALL SAMPLES
2)																						TRANSPORTED
3)																						TO LAB ON
4)																						ICE
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	10-31-07/1600	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			11/1/07 1200
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐

LAB USE ONLY
SPSA-LF
Regional Landfill
07110025
DUE: 10 Days
Recd: 11/01/07

COOLER TEMP 1.5 °C

SPSA-LF
Regional Landfill

07110025
DUE: 10 Days
Recd: 11/01/07

Sample Conditions Checklist

Opened by: (print) Sw

Lab ID No.:

Date Cooler Opened: RECEIVED NOV 01 2007

(sign)

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☑	☐	☐

COMMENTS

Composite 4 grab VOC's (2 vials ea)
ALL voas preserved

Printed EMS forms are uncontrolled

Check EMS website for current form.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 10/31/07 @ 0855
Date / Time

Flow Secured: 10/31/07 @ 1530
Date / Time

pH Meter: Beckman Model 255

Calibration: 10/31/07 @ 0808
Date / Time

Buffer Solutions: 4.00 (Result) 4.00 | 7.01 (Result) 7.00 | 10.05 (Result) 10.00

Slope: 99.5

Calibration Verification: 7.00/7.01
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/31/07 @ 0900
Date / Time

pH Result: 6.88 @ 14.3 C

Time of Analysis: 0903

Phenols Interference Check: Positive
(Positive or Negative)

0905
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **10/31/07 @ 0856**
Date / Time

Composite Stop: **10/31/07 @ 1530**
Date / Time

Comments: Added FAS to remove interference. pH cal method: pH value (4500- H^+-B)/ Eletrometric Method.

EMS Form 30-LDF HRSD Sampling Worksheet

Last Revised 1/30/07

TRANSMISSION VERIFICATION REPORT

TIME : 12/10/2007 13:35
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	12/10 13:31
FAX NO./NAME	4643985
DURATION	00:03:24
PAGE(S)	12
RESULT	OK
MODE	STANDARD ECM

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Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
Acrolein	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Acrylonitrile	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chloromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Vinyl chloride	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Bromomethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Trichlorofluoromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1-Dichloroethylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Methylene chloride	< 20 ug/L	20.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
trans-1,2-Dichloroethylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1-Dichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chloroform	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1,1-Trichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Carbon tetrachloride	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Benzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,2-Dichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Trichloroethylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,2-Dichloropropane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Bromodichloromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
2-Chloroethyl vinyl ether	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
cis-1,3-Dichloropropene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Toluene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB

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Parameter	Result	LOQ	COMPOSITE SAMPLE Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
trans-1,3-Dichloropropene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1,2-Trichloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Tetrachloroethylene (PCE)	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
omochloromethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Chlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Ethylbenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
m,p-Xylenes	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
o-Xylene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Xylenes, Total	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Bromoform	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,1,2,2-Tetrachloroethane	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,3-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,4-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
1,2-Dichlorobenzene	< 10 ug/L	10.0	10/31/07 856	10/31/07 1530	11/09/07 1952	EPA624	DMB
Methyl ethyl ketone	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/09/07 1952	SW8260B	DMB
Methyl isobutyl ketone	< 50 ug/L	50.0	10/31/07 856	10/31/07 1530	11/09/07 1952	SW8260B	DMB
4-Chloro-3-methylphenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2-Chlorophenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Dichlorophenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dimethylphenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV

Laboratory Order ID: 07110025

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001
Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
4,6-Dinitro-2-methylphenol	< 50 ug/L	50	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dinitrophenol	< 50 ug/L	50	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2-Nitrophenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4-Nitrophenol	< 50 ug/L	50	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Pentachlorophenol	< 20 ug/L	20	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Phenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4,6-Trichlorophenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Acenaphthene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Acenaphthylene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Anthracene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (a) anthracene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (b) fluoranthene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (k) fluoranthene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (g,h,i) perylene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzo (a) pyrene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4-Bromophenyl phenyl ether	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Butyl benzyl phthalate	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
bis (2-Chloroethoxy) methane	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
bis (2-Chloroethyl) ether	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV

Laboratory Order ID: 07110025

Industry Name:	SPSA-LF			
Sample Pt. Address:	Regional Landfill			
Sample Pt. Location:	Leachate Pond		Laboratory Sample I.D.:	07110025-001
Industrial Waste Code:				
Sample Point Code:				
Sampled By:	Charles E. Williams			

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
bis (2-Chloroisopropyl) ether	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4-Chlorophenyl phenyl ether	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Chrysene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
enz (a,h) anthracene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Di-n-butyl phthalate	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,2-Dichlorobenzene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,3-Dichlorobenzene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,4-Dichlorobenzene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Diethyl phthalate	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Dimethyl phthalate	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,4-Dinitrotoluene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,6-Dinitrotoluene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Di-n-octyl phthalate	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
bis (2-Ethylhexyl) phthalate	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Fluoranthene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Fluorene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachlorobenzene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachlorobutadiene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
achlorocyclopentadiene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Hexachloroethane	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

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Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
Indeno (1,2,3-cd) pyrene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Isophorone	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Naphthalene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Nitrobenzene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
N-Nitrosodimethylamine	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
N-Nitrosodiphenylamine	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
N-Nitrosodi-N-propylamine	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Phenanthrene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Pyrene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,2,4-Trichlorobenzene	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
Benzidine	< 50 ug/L	50	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
3,3-Dichlorobenzidine	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
2,3,4,6-Tetrachlorophenol	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
1,2-Diphenylhydrazine	< 10 ug/L	10	10/31/07 856	10/31/07 1530	11/06/07 1848	EPA625	JHV
4,4-DDD	< 0.1 ug/L	0.100	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
4,4-DDE	< 0.04 ug/L	0.040	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
4,4-DDT	< 0.12 ug/L	0.120	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Aldrin	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
alpha-BHC	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
beta-BHC	< 0.05 ug/L	0.050	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Chlordane	< 1 ug/L	1.00	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW

Laboratory Order ID: 07110025

Industry Name: SPSA-LF
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Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110025-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
delta-BHC	< 0.05 ug/L	0.050	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Dieldrin	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endosulfan I	< 0.1 ug/L	0.100	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endosulfan II	< 0.04 ug/L	0.040	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endosulfan sulfate	< 0.5 ug/L	0.500	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
rin	< 0.1 ug/L	0.100	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Endrin aldehyde	< 0.2 ug/L	0.200	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
gamma-BHC (Lindane)	< 0.02 ug/L	0.020	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Heptachlor	< 0.05 ug/L	0.050	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Heptachlor epoxide	< 0.2 ug/L	0.200	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Methoxychlor	< 2 ug/L	2.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
Toxaphene	< 3 ug/L	3.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1016	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1221	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1232	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1242	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1248	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1254	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW
PCB as Aroclor 1260	< 5 ug/L	5.0	10/31/07 856	10/31/07 1530	11/08/07 2359	EPA608	RMW

Laboratory Order ID: 07110025

Industry Name: SPSA-LF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/15/2007

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: HRSD SEMI - ANNUAL TOXIC ORGANICS
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x 7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

						MATRIX									ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	624 VOLATILES 40ml-VIALS HCl	624 VOLATILES AMBER LITER ICE	608 PESTICIDES AMBER LITER ICE					Quote I.D.: pH CAL @ 0808 pH = 6.98 @ 0903 TEMP = 14.3°C FLOW STARTED 0855 FLOW SECURED @ 1530 SEMI-ANNUAL SAMPLES POURED @ 0900, 1100, 1300, 1535 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	10-31-07	0854	10-31-07	1530	10		✓			✓					8	1	1					ALL SAMPLES
2)																						TRANSPORTED
3)																						TO LAB ON
4)																						ICE
5)																						
6)																						
7)																						
8)																						Ice
9)																						
10)																						

RELINQUISHED:	DATE / TIME 10-31-07/1600	RECEIVED: COURIER	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME 11/1/07/1200
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐
- Level IV ☐

LAB USE ONLY

COOLER TEMP 1.5 °C

SPSA-LF
Regional Landfill

07110025
DUE: 10 Days
Recd: 11/01/07

70329.xls

SPSA-LF **07110025**
Regional Landfill
DUE: 10 Days
Recd: 11/01/07

Sample Conditions Checklist

Opened by: (print) Jw

Date Cooler Opened: RECEIVED NOV 01 2007

Lab ID No.:

(sign)

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☑	☐	☐

COMMENTS

Composite 4 grab VOC's (2 vials ea)
ALL voas preserved

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	November 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Certified Reports:	Faxed and Mailed December 10, 2007
Number of Pages:	9

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities; 10-4-07 Automation Controls Service Report; Godwin Pump Curve Chart	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station Account No. 3473040009

Service Location 3136 Woodland Drive City Norfolk

Circle One

Meter S/N 99824707 Date Read 11/30/07 Reading* 325710 CF [✓ GAL]

Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

ter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy
(printed)

Title Environmental Compliance Coordinator

Signature Amy E. Hardy

Date 12-10-07

Revised 06/11/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name: Southeastern Public Service Authority
Sample Point Address: #1 Bob Foeller Drive, Suffolk, VA.
Location: Regional Landfill (Permit # 0087)

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.04	-----	<5.0	11-01-07 09:55	11-01-07 09:58	EPA 4500-H^+B	CEW
Total Phenols	----	mg/l	0.021	11-01-07 09:55	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E. Hardy
Date: 12/10/07

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07110039

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110039-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	22.9 mg/L	2.0	11/01/07 952	11/01/07 1430	11/02/07 1740	SM5210B	RPF
TSS	24.8 mg/L	1.0	11/01/07 952	11/01/07 1430	11/06/07 1530	SM2540D	LG
Cu	0.031 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Cr	0.017 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Zn	0.205 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
[illegible]	< 0.01 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Ni	0.061 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
As	0.024 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	11/01/07 952	11/01/07 1430	11/09/07 1058	EPA245.1	DMH

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Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 11/9/2007

AIR WATER SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
PROJECT NAME: HRSD MONTHLY LEACHATE + TSS
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample for compliance reporting? YES NO
Is sample from a chlorinated supply? YES NO
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	TSS 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3					Quote I.D.: PH CAL @ 0835 PH=7.0 @ 0958 TEMP=17.8°C FLOW STARTED 0952 FLOW SECURED 1430 PHENOLS POSD 1001 COULD NOT REMOVE INTERFERENCE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	11-1-07	0958	11-1-07	1430	3		✓			✓					1	1	1					E FAS DONOT
2)																						ANALYSIS
3)																						
4)																						SAMPLES POURED
5)																						@ 1430
6)																						
7)																						ALL SAMPLES
8)																						TRANSPORTED ON
9)																						ICE TO LAB
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	11-1-07 / 1542	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME 11/02/07 12[illegible]
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
SPSA-LF
Regional Landfill

COOLER TEMP 2.0 °C Ice
07110039
DUE: 5 Days
Recd: 11/02/07

J329.xls

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month NOV Year 2007

EST	Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped	EST
72,960	1	7230123	80054 *	17	7416636	146576 *	72960
36,480	2	7270060	39937 *	18	7416636	0	
	3	7270060	0	19	7416636	0	
	4	7270060	0	20	7416636	0	
	5	7270060	0	21	7416636	0	
	6	7270060	0	22	7416636	0	
	7	7270060	0	23	7556920	140284	* 72,960
	8	7270060	0	24	7556920	0	
	9	7270060	0	25	7556920	0	
	10	7270060	0	26	7556920	0	
	11	7270060	0	27	7635299	78379	* 72,960
	12	7270060	0	28	7635299	0	
	13	7270060	0	29	7635299	0	
	14	7270060	0	30	7635299	0	
	15	7270060	0	31			
	16	7270060	0				

Monthly Total: 328,320 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. §1319. (Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.

Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 12-6-07

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

*- lse high readings because flowmeter and ultrasonic cleaner are not working properly. ase refer to 10/4/07 Service Report from Automation Controls. Based on pump rate of 304 gpm (refer to Godwin Pump Curve chart) and four discharges of four hours with one additional discharge of two hours, estimated quantities are listed above under "EST."

AUTOMATION CONTROLS INC. 200 MAIN STREET, NEWPORT NEWS, VIRGINIA 23601

PHONE: (757) 599-6884
FAX: (757) 599-0061
INTERNET: *www.acin.com*

SERVICE REPORT

SPSA
1 Bob Foeller Drive
Suffolk VA 23434
Phone: 757-539-9373, ext. 303
Fax: 757-539-9379

Thursday, Oct 4, 2007

Contact: Mike Smith
Ref: Effluent Flowmeter FT-105

ACI Technician: David K. Spruill, ISA CCST III
ACI Job / Service No.: 2007-373

We are pleased to offer our service report for the subject project. The following is a description of the work performed.

Date / Hours: Thu-Oct 4, 2007 / 5.25 ST hrs.

ACI Comments:

1. Problem:
   a. ACI was requested to perform an annual calibration check of the effluent flowmeter (FT-105), during my check I found the flowmeter totalizer reading high on both the flowmeter and the door mounted display (FQI-105).

   b. The total count (between start and finish of the test) read the same on both units (949 gallons pumped). The calculated total (based upon draw down measurement of the wet well volume) indicated that only 700 gallons had been pumped during the test.

   c. In addition, I noted that the ultrasonic cleaner, which works in conjunction with the magmeter, is not functioning properly (no pulse indication).

2. Conclusion:
   a. The readings indicate that one of the following conditions is the probable cause:
      1) The flowmeter is bad and / or its ultrasonic cleaner is bad. If repairs would be attempted, both units will need to be checked together.
      2) Something is partially blocking the flowtube causing a higher velocity to be read by the magmeter and therefore a higher flow rate and totalizer count. The blockage can be caused by excessive coating of the flowtube liner, or something caught in the flowtube restricting its cross-sectional area.

3. Solution:
   a. Although removing a blockage or coating after removal of the flowtube may bring the readings back within specification, without the ultrasonic cleaner operating properly, the reading error will return well before the next calibration is due.

b. Upon checking with the manufacturer, I found they no longer supply, support, or repair this model or provide an equivalent unit. In addition, no industrial electronics repair centers will repair this unit (with its ultrasonic cleaner).

c. Therefore, ACI suggests replacing the unit with a newer model which does not need an ultrasonic unit due to higher sensitivity and provides a higher accuracy than the original unit. ACI can refer SPSA to an instrument rep for replacement of the magmeter, if so desired. ACI can provide some, but not all of the data required for proper selection of a new magmeter. The remainder of the data will need to be determined by a site evaluation of the existing flowtube and transmitter electronics.

d. In addition, ACI suggests that a TVSS (transient voltage surge suppressor) be installed and wired into the power source for the new flowmeter as well as a surge protector for the main MCC power feed. The protection afforded by these units has improved greatly in recent years (Note: The original design did not call for a surge protection / suppression of any kind for the magmeter or MCC feeds). ACI can supply these units if desired.

Please fill in any comments you may have below and fax a signed copy of this report to my or Steve Armstrong's attention using the office fax number at the top of this report, Thank you.

Customer Comments:

____

____

____

____

____

____

Customer Signature

Date

Berkeley Electronic Catalog

Pump Performance Datasheet

Customer	:
Customer reference	:
Item number	:
Service	:
Quantity of pumps	: 1

Quote number	:
Pump size	: 3 x 3 x 6 (B3TPKS) - 10 HP (Self-prime)
Stages	: 1
Based on curve number	: 5079 (10 HP)
Date last saved	: 06 Oct 2006

Operating Conditions

Flow, rated	: 282.8 USgpm
Head, rated (requested)	: 108.5 ft
Head, rated (actual)	: 108.5 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Liquid

Liquid type	: --Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 0.998 / 0.998 SG
Viscosity, rated	: 1.00 cP
-	:

Performance

Pump speed, rated	: 3,450 rpm
Impeller diameter, rated	: 6.59 in
Impeller diameter, maximum	: 6.59 in
Impeller diameter, minimum	: 6.59 in
Efficiency	: 65.64 %
NPSH required / margin required	: 16.31 / 0.00 ft
Specific speed / Suction specific speed	: 1,563 / 8,591 US units
MCSF	: 100.0 USgpm
Head, maximum, rated diameter	: 159.0 ft
Head rise to shutoff	: N/A %
Flow, best eff. point (BEP)	: 282.8 USgpm
Flow ratio (rated / BEP)	: 100.00 %
Diameter ratio (rated / max)	: 100.00 %
Head ratio (rated dia / max dia)	: 100.00 %
Viscous coefficients (CQ / CH / CE)	: 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Material

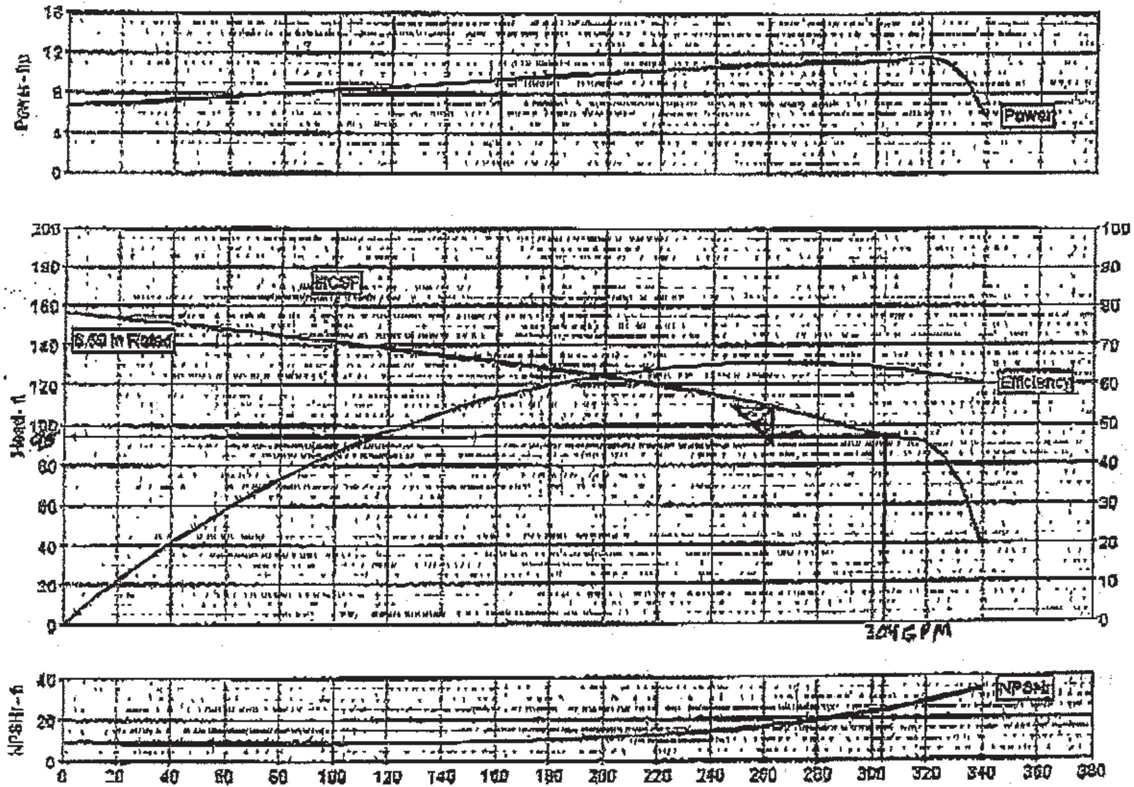
Material requested	: Not specified
Material selected	: Not specified

Pressure Data

Maximum working pressure	: 67.52 psi.g
Maximum allowable working pressure	: 80.00 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data

Driver sizing specification	: Rated power
Margin over specification	: 0.00 %
Service factor	: 1.00 (used)
Power, hydraulic	: 7.19 hp
Power, rated	: 10.86 hp
Power, maximum, rated diameter	: 11.19 hp
Minimum recommended motor rating	: 10.00 hp / 7.46 kW (Fixed)



BERKELEY Pumps / Pentair Water · 293 Wright Street · Delavan, Wisconsin 53115
phone: 1-888-237-5353 · fax: 1-800-426-9446

TRANSMISSION VERIFICATION REPORT

TIME : 12/10/2007 13:53
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	12/10 13:50
FAX NO./NAME	4643985
DURATION	00:02:55
PAGE(S)	09
RESULT	OK
MODE	STANDARD ECM

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	October-November 2007 Process Discharge for Pond Sediment Removal
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	November 16, 2007
Date Mailed:	November 19, 2007
Number of Pages:	20

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Regional Landfill	0087 Acct# 4178540009	11-16-07 Cover Letter	None
Regional Landfill	0087 Acct# 4178540009	10/22/07-10/26/07and 11/1/07-11/2/07: pH readings Air, Water, &Soil Laboratories COAs Universal Laboratories COA	None

CERTIFICATION STATEMENT

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Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 11/16/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
Phone: (757) 420-4700; Fax: (757) 424-4133
www.spsa.com

November 16, 2007

Mr. Craig Forbes
Hampton Roads Sanitation District
P.O. Box 5902
Virginia Beach, VA 23471-0902

**RE: Southeastern Public Service Authority (SPSA)
Regional Landfill, Permit No. 0087**

Dear Mr. Forbes:

SPSA Regional Landfill pumped down the leachate settlement pond on October 22-26, October 29-31, and November 1-2, 2007. The pond was pumped down in order to have a contractor remove sediment and sludge from the bottom. The material removed was disposed of properly in Cell VI at Regional Landfill. The valve was shut off from the aeration pond to the settlement pond and discharge did not exceed 175,000 gallons per day.

As discussed, SPSA personnel collected daily composite samples for the process discharge period and the analytical results for each day are attached for your information. The process discharge ended on November 2, 2007 and the contractor removed the solid materials on November 5, 2007. As of November 6, 2007, the leachate collection ponds have returned to normal operations.

If you have any questions, please contact me at (757) 539-9373, ext. 7.

Sincerely,

Amy E. Hardy

Amy E. Hardy
Environmental Compliance Coordinator

Attachments

cc: Mr. Chuck Harrell
Mr. Scott Whitehurst
Ms. Christel Dyer

P.O. Box 1346
Chesapeake, VA 23320-1346

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name:	Southeastern Public Service Authority
Sample Point Address:	#1 Bob Foeller Drive, Suffolk, VA.
Location:	Regional Landfill (Permit # 0087)
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams for Process Discharge/Sediment Removal from Settlement Pond

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.13	-----	<5.0	10-22-07 10:10	10-22-07 10:13	EPA 4500-H^+B	CEW
pH	7.70	-----	<5.0	10-23-07 09:36	10-23-07 09:38	EPA 4500-H^+B	CEW
pH	7.51	-----	<5.0	10-24-07 09:38	10-24-07 09:43	EPA 4500-H^+B	CEW
pH	7.03	-----	<5.0	10-25-07 09:42	10-25-07 09:46	EPA 4500-H^+B	CEW
pH	7.05	-----	<5.0	10-26-07 08:42	10-26-07 08:43	EPA 4500-H^+B	CEW
pH	7.75	-----	<5.0	10-29-07 09:50	10-29-07 09:53	EPA 4500-H^+B	CEW
pH	7.11	-----	<5.0	10-30-07 09:34	10-30-07 09:37	EPA 4500-H^+B	CEW
pH	6.88	-----	<5.0	10-31-07 09:00	10-31-07 09:03	EPA 4500-H^+B	CEW
pH	7.04	-----	<5.0	11-01-07 09:55	11-01-07 09:58	EPA 4500-H^+B	CEW
pH	7.08	-----	<5.0	11-02-07 07:54	11-02-07 07:58	EPA 4500-H^+B	CEW

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 07100391

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	October 23, 2007 October 30, 2007
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	Regional Landfill	Purchase Order	4500024514

Sample I.D.: Leachate Pond
Date/Time Sampled: 10/22/07 10:10
Laboratory Sample I.D.: 07100391-001

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
Total Recoverable Phenolics	EPA420.1	0.10 mg/L	0.05	10/29/07 10:25	RPF

Sample I.D.: Leachate Pond
Date/Time Sampled (Start/Stop): 10/22/07 10:04 to 10/22/07 14:10
Laboratory Sample I.D.: 07100391-002

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
Arsenic	EPA200.7	0.011 mg/L	0.010	10/26/07 15:34	CGT
Cadmium	EPA200.7	< 0.01 mg/L	0.010	10/26/07 15:34	CGT
Chromium	EPA200.7	0.017 mg/L	0.010	10/26/07 15:34	CGT
Copper	EPA200.7	0.051 mg/L	0.010	10/26/07 15:34	CGT
Lead	EPA200.7	< 0.01 mg/L	0.010	10/26/07 15:34	CGT
Mercury	EPA245.1	< 0.0002 mg/L	0.0002	10/25/07 9:58	DMH
Nickel	EPA200.7	0.066 mg/L	0.010	10/26/07 15:34	CGT
Zinc	EPA200.7	0.284 mg/L	0.010	10/26/07 15:34	CGT
BOD	SM5210B	14.7 mg/L	2.0	10/24/07 11:40	LG

TED

Ted Soyars
Laboratory Manager

AIR WATER & SOIL
LABORATORIES, INC.
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100408

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100408-001
Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	< 0.05 mg/L	0.05	10/23/07 936	10/29/07 1025	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and ll attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

ignature: Ted Soyars
ame: Ted Soyars
itle: Laboratory Manager

Date Issued: 10/31/2007

AIR WATER & SOIL
LABORATORIES, INC.
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100408

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100408-002
Industrial Waste Code:
Sample Point Code:
Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	18.4 mg/L	2.0	10/23/07 933	10/23/07 1349	10/24/07 1140	SM5210B	LG
Cu	0.045 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Zn	0.272 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Ni	0.063 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
C	< 0.01 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
As	0.025 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/23/07 933	10/23/07 1349	10/30/07 1037	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 10/31/2007

AIR WATER & SOIL
LABORATORIES, INC.
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100430

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100430-001
Industrial Waste Code:
Sample Point Code:
Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.36 mg/L	0.05	10/24/07 938	10/29/07 1025	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and ll attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

ignature:
ame: Ted Soyars
itle: Laboratory Manager

Date Issued: 11/1/2007

AIR WATER & SOIL
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Laboratory Order ID: 07100430

Industry Name:	SPSA-LF
Sample Pt. Address:	Regional Landfill
Sample Pt. Location:	Leachate Pond
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

Laboratory Sample I.D.: 07100430-002

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	26.7 mg/L	2.0	10/24/07 935	10/24/07 1830	10/25/07 1732	SM5210B	VLG
TSS	40 mg/L	1.0	10/24/07 935	10/24/07 1330	10/26/07 1500	SM2540D	LG
Cu	0.045 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Zn	0.270 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
N	0.064 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
As	0.022 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/24/07 935	10/24/07 1330	10/30/07 1102	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/1/2007

AIR WATER & SOIL
LABORATORIES, INC.®
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Laboratory Order ID: 07100474

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07100474-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	< 0.05 mg/L	0.05	10/25/07 942	10/29/07 1025	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/2/2007

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aboratory Order ID: 07100474

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07100474-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

arameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
OD	30.1 mg/L	2.0	10/25/07 941	10/25/07 1335	10/26/07 1813	SM5210B	RPF
SS	31 mg/L	1.0	10/25/07 941	10/25/07 1335	10/29/07 1130	SM2540D	LG
u	0.042 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
r	0.019 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
n	0.248 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
b	< 0.01 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
	0.064 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
	< 0.01 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
s	0.019 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
g	< 0.0002 mg/L	0.0002	10/25/07 941	10/25/07 1335	10/30/07 1127	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and ll attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe e submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under ese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

ignature:
ame: Ted Soyars
itle: Laboratory Manager

Date Issued: 11/2/2007

AIR WATER & SOIL
LABORATORIES, INC.®
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aboratory Order ID: 07100476

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100476-001
Industrial Waste Code:
Sample Point Code:
Sampled By:

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.13 mg/L	0.05	10/26/07 842	10/29/07 1025	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and ll attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe e submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false formation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under ese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

ignature: TED
lame: Ted Soyars
itle: Laboratory Manager

Date Issued: 11/2/2007

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Laboratory Order ID: 07100476

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100476-002
Industrial Waste Code:
Sample Point Code:
Sampled By:

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	27.5 mg/L	2.0	10/26/07 1230	10/26/07 1230	10/26/07 1813	SM5210B	RPF
TSS	22 mg/L	1.0	10/26/07 1230	10/26/07 1230	10/29/07 1130	SM2540D	LG
Cu	0.042 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Zn	0.230 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Ni	0.064 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
	< 0.01 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
As	0.021 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/26/07 1230	10/26/07 1230	10/30/07 1129	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and ll attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

ignature:
Name: Ted Soyars
itle: Laboratory Manager

Date Issued: 11/2/2007

AIR WATER & SOIL
LABORATORIES, INC.
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100521

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07100521-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.08 mg/L	0.05	10/29/07 950	11/05/07 1010	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: TED
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/6/2007

AIR WATER & SOIL
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Laboratory Order ID: 07100521

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100521-001
Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	16.9 mg/L	2.0	10/29/07 949	10/29/07 1402	10/31/07 1655	SM5210B	RPF
TSS	16.2 mg/L	1.0	10/29/07 949	10/29/07 1402	11/01/07 1350	SM2540D	LG
Cu	0.042 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Cr	0.017 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Zn	0.224 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Ni	0.062 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
[illegible]	< 0.01 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
As	0.020 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/29/07 949	10/29/07 1402	11/02/07 1116	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under hese statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/6/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100543

Industry Name:	SPSA-LF
Sample Pt. Address:	Regional Landfill
Sample Pt. Location:	Leachate Pond
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

Laboratory Sample I.D.: 07100543-001

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.1 SU	--	10/30/07 934	10/30/07 937	SM4500-H B	Client
Phenols	0.09 mg/L	0.05	10/30/07 934	11/05/07 1010	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under se statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/7/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100543

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100543-002
Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	67.5 mg/L	2.0	10/30/07 932	10/30/07 1400	10/31/07 1655	SM5210B	RPF
TSS	20.0 mg/L	1.0	10/30/07 932	10/30/07 1400	11/01/07 1350	SM2540D	LG
Cu	0.033 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Zn	0.204 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Ni	0.060 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
[illegible]	< 0.01 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
As	< 0.01 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/30/07 932	10/30/07 1400	11/02/07 1150	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: TED
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/7/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07110017

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07110017-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	6.9 SU	--	10/31/07 900	10/31/07 903	SM4500-H B	Client
Phenols	< 0.05 mg/L	0.05	10/31/07 900	11/05/07 1010	EPA420.1	RPF

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe he submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under e statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/7/2007

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LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07110017

Industry Name:	SPSA-LF
Sample Pt. Address:	Regional Landfill
Sample Pt. Location:	Leachate Pond
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

Laboratory Sample I.D.: 07110017-002

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	39.5 mg/L	2.0	10/31/07 856	10/31/07 1530	11/06/07 1700	SM5210B	LG
TSS	27.0 mg/L	1.0	10/31/07 856	10/31/07 1530	11/01/07 1350	SM2540D	LG
Cu	0.032 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Cr	0.018 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Zn	0.231 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Ni	0.060 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
[illegible]	< 0.01 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
As	0.013 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/31/07 856	10/31/07 1530	11/02/07 1152	EPA245.1	DMH

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false nformation, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/7/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07110039

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07110039-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	22.9 mg/L	2.0	11/01/07 952	11/01/07 1430	11/02/07 1740	SM5210B	RPF
TSS	24.8 mg/L	1.0	11/01/07 952	11/01/07 1430	11/06/07 1530	SM2540D	LG
Cu	0.031 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Cr	0.017 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Zn	0.205 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
[illegible]	0.061 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
[illegible]	< 0.01 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
As	0.024 mg/L	0.010	11/01/07 952	11/01/07 1430	11/09/07 1208	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	11/01/07 952	11/01/07 1430	11/09/07 1058	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/9/2007

TELEPHONE: (757) 865-0880
FAX: (757) 865-8014
TOLL-FREE: (800) 695-2162

UNIVERSAL LABORATORIES

20 Research drive, Hampton, Va. 23666

REPORT OF ANALYSIS

Order ID:: **0711033**

(REPORT DATE) 13-Nov-07

TO: **Southeastern Public Service Authority**
723 Woodlake Drive
Chesapeake, Va 23327

ATTN: Amy Hardy

Industry Name: Southeastem Public Service Authority

Sample Pt Address:

Location: Leachate Pond Grab.

Industrial Waste Code:

Sample Point Code:

Collected by: CLIENT

UL Project ID: HRSD discharge

Sample ID: LEACHATE POND GRAB.

Orders.Comment:

Leachate Pond Grab.

Parameter	Result	Units	Report Limit	Start Date/ Time	End Date/Time	Analysis Date/Time	Method	Method Reference	Analyst
pH (client provided)	7.1	S.U.	0.1			11/2/2007 07:58:00	SM 4500 H/B	18th Edition	C

Leachate Pond Composite

Parameter	Result	Units	Report Limit	Start Date/ Time	End Date/Time	Analysis Date/Time	Method	Method Reference	Analyst
BOD5	30	mg/L	2	11/02/07 07:51	11/02/07 11:27	11/3/2007 15:03:00	SM-5210	18th Edition	EG
Total Suspended Solids	47	mg/L	1	11/02/07 07:51	11/02/07 11:27	11/7/2007 13:40:00	SM-2540 D	18th Edition	AK
Copper (Total)	0.027	mg/L	0.001	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Chromium (Total)	<	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/13/2007 11:01:00	EPA 200.7	40 CFR part 136 App. A	CC
Zinc (Total)	0.225	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Lead (Total)	<	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Nickel (Total)	<	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC

UNIVERSAL LABORATORIES

20 Research drive, Hampton, Va. 23666

TELEPHONE: (757) 865-0880
FAX: (757) 865-8014
TOLL-FREE: (800) 695-2162

REPORT OF ANALYSIS

Order ID:: 0711033

(REPORT DATE) 13-Nov-07

TO: **Southeastern Public Service Authority**
723 Woodlake Drive
Chesapeake, Va 23327

ATTN: Amy Hardy

Industry Name: Southeastern Public Service Authority
Sample Pt Address:
Location: Leachate Pond Composite
Industrial Waste Code:
Sample Point Code:
Collected by: CLIENT

UL Project ID: HRSD discharge

Sample ID: LEACHATE POND COMPOSITE

Orders.Comment:

Leachate Pond Composite

Parameter	Result	Units	Report Limit	Start Date/ Time	End Date/Time	Analysis Date/Time	Method	Method Reference	Analyst
Cadmium (Total)	0.012	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Arsenic (Total)	0.027	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Mercury (Total)	<	mg/L	0.0002	11/02/07 07:51	11/02/07 11:27	11/8/2007 10:21:00	SM-3112 B	18th Edition	EF

Respectfully Submitted,

AIR WATER & SOIL
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Certificate of Analysis

Final Report

Laboratory Order ID 07100391

Client Name:	SPSA-LF 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	October 23, 2007 October 30, 2007
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:	Regional Landfill	Purchase Order	4500024514

Sample I.D.: Leachate Pond — Laboratory Sample I.D.: 07100391-001

Date/Time Sampled: 10/22/07 10:10

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
Total Recoverable Phenolics	EPA420.1	0.10 mg/L	0.05	10/29/07 10:25	RPF

Sample I.D.: Leachate Pond — Laboratory Sample I.D.: 07100391-002

Date/Time Sampled (Start/Stop): 10/22/07 10:04 to 10/22/07 14:10

Parameter	Method	Sample Results	Rep Limi	Analysis Date/Time	Analyst
Arsenic	EPA200.7	0.011 mg/L	0.010	10/26/07 15:34	CGT
Cadmium	EPA200.7	< 0.01 mg/L	0.010	10/26/07 15:34	CGT
Chromium	EPA200.7	0.017 mg/L	0.010	10/26/07 15:34	CGT
Copper	EPA200.7	0.051 mg/L	0.010	10/26/07 15:34	CGT
Lead	EPA200.7	< 0.01 mg/L	0.010	10/26/07 15:34	CGT
Mercury	EPA245.1	< 0.0002 mg/L	0.0002	10/25/07 9:58	DMH
Nickel	EPA200.7	0.066 mg/L	0.010	10/26/07 15:34	CGT
Zinc	EPA200.7	0.284 mg/L	0.010	10/26/07 15:34	CGT
BOD	SM5210B	14.7 mg/L	2.0	10/24/07 11:40	LG

Ted Soyars
Laboratory Manager

AIR WATER & SOIL
LABORATORIES, INC.

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379

PROJECT NAME: LEACHATE POND SAMPLING
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): Bobby Scott
SAMPLER SIGNATURE:
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H2SO4	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3	BOD 1000ml PLASTIC ICE					Quote I.D.: PH CAL @ 820 PH= 7.13 FLOW STARTD 1000 FLOW STOPD 1405 Phenols Neg'' PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			10-22-07	1010	1	1				X					1							
2) LEACHATE POND	10-22-07	1004	10-22-07	1410	2					X						1	1					
3)																						
4)																						
5)																						Samples
6)																						poured @
7)																						1415
8)																						
9)																						All Samples
10)																						transported to lab on ice

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	10-22-07	courier	
		Weinrich 10/23/07 1100	

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
SPSA-LF
Regional Landfill
07100391
DUE: 5 Days
Recd: 10/23/07

COOLER TEMP 1.8 °C

v070329.xls

SPSA-LF
Regional Landfill

07100391
DUE: 5 Days
Recd: 10/23/07

Sample Conditions Checklist

Opened by: (print) ______

Lab ID No.: ______

Date Cooler Opened: RECEIVED OCT 23 2007

(sign) ______

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

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Laboratory Order ID: 07100408

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100408-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	18.4 mg/L	2.0	10/23/07 933	10/23/07 1349	10/24/07 1140	SM5210B	LG
Cu	0.045 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Zn	0.272 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
	0.063 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
As	0.025 mg/L	0.010	10/23/07 933	10/23/07 1349	10/31/07 1128	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/23/07 933	10/23/07 1349	10/30/07 1037	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 10/31/2007

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Laboratory Order ID: 07100408

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100408-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	< 0.05 mg/L	0.05	10/23/07 936	10/29/07 1025	EPA420.1	RPF

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Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 10/31/2007

AIR WATER & SOIL
LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: LEACHATE POND SAMPLING
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 X7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS: BOD 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3	PHENOLS AMBER LITER H2SO					COMMENTS: Quote I.D.: PH CAL@0805 PH = 7.70@0932 FLOW STARTED 0930 FLOW STOPPED 1349 PHENOL POS FOR INTERFERENCE REMOVED & FAS PROCEED WITH PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			10-23-07	0936	1	✓				✓							1					ANALYSIS
2) LEACHATE POND	10-23-07	0932	10-23-07	1349	2		✓			✓					1	1						
3)																						SAMPLES
4)																						POURED@1350
5)																						
6)																						ALL SAMPLES
7)																						TRANSPORTED
8)																						ON ICE
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	10-23-07/1602	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			10/24/07 1100
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐
- Level IV ☐

LAB USE ONLY

COOLER TEMP 2.7 °C

SPSA-LF
Regional Landfill

07100408
DUE: 5 Days
Recd: 10/24/07

1329 xls

SPSA-LF
Regional Landfill

07100408
DUE: 5 Days
Recd: 10/24/07

Sample Conditions Checklist

Opened by: (print)

Lab ID No.:

Date Cooler Opened: RECEIVED OCT 24 2007

(sign)

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

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Laboratory Order ID: 07100430

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100430-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.36 mg/L	0.05	10/24/07 938	10/29/07 1025	EPA420.1	RPF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 11/1/2007

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Laboratory Order ID: 07100430

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100430-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	26.7 mg/L	2.0	10/24/07 935	10/24/07 1330	10/25/07 1732	SM5210B	VLG
TSS	40 mg/L	1.0	10/24/07 935	10/24/07 1330	10/26/07 1500	SM2540D	LG
Cu	0.045 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Zn	0.270 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
	< 0.01 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Ni	0.064 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
As	0.022 mg/L	0.010	10/24/07 935	10/24/07 1330	10/31/07 1203	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/24/07 935	10/24/07 1330	10/30/07 1102	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/1/2007

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
Is sample for compliance reporting? [✓ YES] NO

PROJECT NAME: LEACHATE POND SAMPLING
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500084514
REGULATORY AUTHORITY:

Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles G.
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H_2SO_4	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO_3	BOD 1000ml PLASTIC ICE	TSS 1000ml PLASTIC ICE				COMMENTS Quote I.D.: pH CAL @0648 pH = 7.51 @0943 FLOW EST @ 0935 FLOW SECURED @ 1330 PHENOLS POS FOR INTERFERENCE REMOVED 2 FAS PROCEED WITH ANALYSIS @0945 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			10-24-07	0938	1	✓				✓					1							SAMPLES POURED
2) LEACHATE POND	10-24-07	0935	10-24-07	1330	3		✓			✓						1	1	1				@1337
3)																						ALL SAMPLES
4)																						TRANSPORTED
5)																						TO LAB ON
6)																						ICE
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles G.	10-24-07/1418	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
M Wenzel	10/25/07 1210		
RELINQUISH	DATE / TIME	RECEIVED:	/ TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
SPSA-LF
Regional Landfill

07100430
DUE: 5 Days
Recd: 10/

COOLER TEMP 4 °C

SPSA-LF
Regional Landfill

07100430
DUE: 5 Days
Recd: 10/25/07

Sample Conditions Checklist

Opened by: (print) ____________ **Lab ID No.:** ____________

Date Cooler Opened: RECEIVED OCT 25 2007 **(sign)** ____________

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

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Laboratory Order ID: 07100474

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100474-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	< 0.05 mg/L	0.05	10/25/07 942	10/29/07 1025	EPA420.1	RPF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 11/2/2007

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Laboratory Order ID: 07100474

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100474-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	30.1 mg/L	2.0	10/25/07 941	10/25/07 1335	10/26/07 1813	SM5210B	RPF
TSS	31 mg/L	1.0	10/25/07 941	10/25/07 1335	10/29/07 1130	SM2540D	LG
Cu	0.042 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
Zn	0.248 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
F	< 0.01 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
Ni	0.064 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
As	0.019 mg/L	0.010	10/25/07 941	10/25/07 1335	10/31/07 1454	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/25/07 941	10/25/07 1335	10/30/07 1127	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/2/2007

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CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: LEACHATE SAMPLING
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR. SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9373	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE: Charles C.

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	MATRIX: Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	ANALYSIS: PHENOLS AMBER LITER H2SO4	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3	BOD 1000ml PLASTIC ICE	TSS 1000ml PLASTIC ICE				COMMENTS: Quote I.D.: PH CAL@ 0600 PH= 7.03@ 944 FLOW ESTD@ 0940 FLOW SECURED@ 1335 PHENOLS POS. @ 0948 REMOVED w/ FAS PROCESS w/ ANALYSIS PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			10-25-07	0948	1	✓				✓					1							SAMPLES POURED
2) LEACHATE POND	10-25-07	0941	10-25-07	1335	3		✓			✓						1	1	1				@ 1337
3)																						
4)																						ALL SAMPLES
5)																						TRANSPORTED
6)																						ON ICE.
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles C.	10-25-07/1425	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME: 10/24/07
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP ______ °C

SPSA-LF 07100474
Regional Landfill
DUE: 5 Days
Recd: 10/26/07

70320.xls

SPSA-LF
Regional Landfill

07100474
DUE: 5 Days
Recd: 10/26/07

Sample Conditions Checklist

Opened by: (print) ______

Lab ID No.: ______

Date Cooler Opened: RECEIVED OCT 26 2007

(sign) ______

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

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Laboratory Order ID: 07100476

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100476-001

Industrial Waste Code:
Sample Point Code:

Sampled By:

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.13 mg/L	0.05	10/26/07 842	10/29/07 1025	EPA420.1	RPF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/2/2007

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Laboratory Order ID: 07100476

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07100476-002

Industrial Waste Code:
Sample Point Code:

Sampled By:

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	27.5 mg/L	2.0	10/26/07 1230	10/26/07 1230	10/26/07 1813	SM5210B	RPF
TSS	22 mg/L	1.0	10/26/07 1230	10/26/07 1230	10/29/07 1130	SM2540D	LG
Cu	0.042 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Zn	0.230 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
F	< 0.01 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Ni	0.064 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
As	0.021 mg/L	0.010	10/26/07 1230	10/26/07 1230	10/31/07 1456	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/26/07 1230	10/26/07 1230	10/30/07 1129	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/2/2007

AIR WATER & SOIL LABORATORIES, INC.

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(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE ____ OF ____

CLIENT NAME: SPSA	PROJECT NAME: Leachate Sampling
CLIENT CONTACT: Amy Hardy	SITE NAME: Regional landfill
CLIENT ADDRESS: 1 Bob foeller dr Suffolk VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9377	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT):

SAMPLER SIGNATURE:

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

										MATRIX						ANALYSIS								COMMENTS
	CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other ____	Phenols Amber liter H2SO4	Metals (As, Cd, Cr, Cu, Pb, Hg Ni, Zn) 500ml plastic HNO3	BOD 1000ml plastic ice	TSS 1000ml plastic ice					Quote I.D.: PH cal 805 PH = 7.05 Flow Estd 0735 Flow secured 1230 Phenols neg for interference 0745 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1)	Leachate pond			10-26-07	0842	1	X				X					1								Samples
2)	Leachate pond	10-26-07	0835	10-26-07	1230	3		X			X						1	1	1					poured @
3)																								1235
4)																								
5)																								
6)																								
7)																								All samples
8)																								transported
9)																								on ice
10)																								

RELINQUISHED:	DATE / TIME 10-26-07	RECEIVED: couriers	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME 10/26/07 1515
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 2.3 °C

AWS COC v070329.xls

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(804)358-8297 FAX

AIR WATER & SOIL LABORATORIES, INC.

CHAIN OF CUSTODY

PAGE ____ OF ____

CLIENT NAME: SPSA
CLIENT CONTACT: Amy Hardy
CLIENT ADDRESS: 1 Bob Foeller dr Suffolk VA
CLIENT PHONE NUMBER: 757-539-4373 x7
CLIENT FAX NUMBER: 757-539-7377
PROJECT NAME: Leachate Sampling
SITE NAME: Regional landfill
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT):
SAMPLER SIGNATURE:
Turn Around Time: ____ Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other ____	Phenols Amber liter H2SO4	Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml plastic HNO3	BOD 1000ml plastic ice	TSS 1000ml plastic ice				Quote I.D.: pH cal 805 pH=7.05 Flow Started 0835 Flow secured 1230 phenols neg for interference 0845 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) Leachate pond			10-26-07	0842	1	X				X					1							Samples
2) Leachate pond	10-26-07	0835	10-26-07	1230	3		X			X						1	1	1				poured @
3)																						1235
4)																						
5)																						
6)																						
7)																						All samples
8)																						transported
9)																						on ice
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	10-26-07	couriers	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			10/26/07 1515
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
~~Level II~~ ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 23 °C

SPSA-LF
Regional Landfill
07100476
DUE: 5 Days
Recd: 10/26/07

70329.xls

SPSA-LF
Regional Landfill

07100476
DUE: 5 Days
Recd: 10/26/07

Sample Conditions Checklist

Opened by: (print)

Lab ID No.:

Date Cooler Opened: RECEIVED OCT 26 2007

(sign)

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

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Laboratory Order ID: 07100521

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100521-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.08 mg/L	0.05	10/29/07 950	11/05/07 1010	EPA420.1	RPF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/6/2007

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Laboratory Order ID: 07100521

Industry Name:	SPSA-LF
Sample Pt. Address:	Regional Landfill
Sample Pt. Location:	Leachate Pond
Laboratory Sample I.D.:	07100521-001
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	16.9 mg/L	2.0	10/29/07 949	10/29/07 1402	10/31/07 1655	SM5210B	RPF
TSS	16.2 mg/L	1.0	10/29/07 949	10/29/07 1402	11/01/07 1350	SM2540D	LG
Cu	0.042 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Cr	0.017 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Zn	0.224 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
	< 0.01 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Ni	0.062 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
As	0.020 mg/L	0.010	10/29/07 949	10/29/07 1402	11/01/07 1412	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/29/07 949	10/29/07 1402	11/02/07 1116	EPA245.1	DMH

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Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/6/2007

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR. SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
PROJECT NAME: LEACHATE SAMPLING
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles S.
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3	TSS 1000ml PLASTIC ICE	PHENOLS AMBER LITER H2SO4				COMMENTS: Quote I.D.: PH CAL@ 0910 PH = 7.75 @0953 FLOW STD 0948 FLOW SECURED @1401 PHENOL NEG FOR INTERFERENCE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	10-29-07	0949	10-29-07	1402	3		✓			✓					1	1	1					ALL SAMPLES
2) LEACHATE POND			10-29-07	0950	1	✓				✓								1				TRANSPORTED
3)																						TO LAB ON
4)																						ICE
5)																						
6)																						
7)																						SAMPLES POURED
8)																						@1408
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles S.	10-29-07/1434	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME 10/30/07 1200
RELINQUISHED	DATE / TIME	RECEIVED:	DA TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐

LAB USE ONLY
COOLER TEMP 3.5 °C
SPSA-LF
Regional Landfill
07100521
DUE: 5 Days
Recd: 10/30.

SPSA-LF
Regional Landfill

07100521
DUE: 5 Days
Recd: 10/30/07

Sample Conditions Checklist

Opened by: (print) ______

Lab ID No.: ______

Date Cooler Opened: RECEIVED

OCT 30 2007

(sign) ______

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

AIR WATER & SOIL
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Laboratory Order ID: 07100543

Industry Name:	SPSA-LF
Sample Pt. Address:	Regional Landfill
Sample Pt. Location:	Leachate Pond
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

Laboratory Sample I.D.: 07100543-001

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	7.1 SU	--	10/30/07 934	10/30/07 937	SM4500-H B	Client
Phenols	0.09 mg/L	0.05	10/30/07 934	11/05/07 1010	EPA420.1	RPF

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: TED

Name: Ted Soyars

Title: Laboratory Manager

Date Issued: 11/7/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100543

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100543-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	67.5 mg/L	2.0	10/30/07 932	10/30/07 1400	10/31/07 1655	SM5210B	RPF
TSS	20.0 mg/L	1.0	10/30/07 932	10/30/07 1400	11/01/07 1350	SM2540D	LG
Cu	0.033 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Zn	0.204 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
	< 0.01 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Ni	0.060 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
As	< 0.01 mg/L	0.010	10/30/07 932	10/30/07 1400	11/05/07 1517	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/30/07 932	10/30/07 1400	11/02/07 1150	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/7/2007

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LABORATORIES, INC.

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: REGIONAL LANDFILL LEACHATE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles S.
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

								MATRIX							ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H2SO4	BOD 1000ml PLASTIC ICE	METALS (AS, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3	TSS 1000ml PLASTIC ICE			ALL SAMPLES TRANSPORTED TO LAB ON ICE	Quote I.D.: PHCALDOB25 PH=7.11 @0937 TEMP=15.9°C FLOW STARTED 0930 FLOW SECURED @ 1358 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			10-30-07	0934	1	✓				✓					1							PHENOLS POS
2) LEACHATE POND	[illegible]0-07	0932	10-30-07	1400	3		✓			✓						1	1	1				FOR INTERFERENCE
3)																						@0940
4)																						ADDED FAS
5)																						TO REMOVE
6)																						INTERFERENCE
7)																						PROCEED Ē
8)																						ANALYSIS
9)																						SAMPLES POURED
10)																						@1403

RELINQUISHED:	DATE / TIME: 10-30-07/1515	RECEIVED: COURIER	DATE / TIME: 10/31/07 1250
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP 1.5 °C ICE

SPSA-LF
Regional Landfill
07100543
DUE: 5 Days
Recd: 10/31/07

0329.xls

SPSA-LF
Regional Landfill

07100543
DUE: 5 Days
Recd: 10/31/07

Sample Conditions Checklist

Opened by: (print) ____________ **Lab ID No.:** ____________

Date Cooler Opened: OCT 31 2007 **(sign)** ____________

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

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Laboratory Order ID: 07110017

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110017-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
pH	6.9 SU	--	10/31/07 900	10/31/07 903	SM4500-H B	Client
Phenols	< 0.05 mg/L	0.05	10/31/07 900	11/05/07 1010	EPA420.1	RPF

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Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 11/7/2007

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Laboratory Order ID: 07110017

Industry Name: SPSA-LF
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07110017-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	39.5 mg/L	2.0	10/31/07 856	10/31/07 1530	11/06/07 1700	SM5210B	LG
TSS	27.0 mg/L	1.0	10/31/07 856	10/31/07 1530	11/01/07 1350	SM2540D	LG
Cu	0.032 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Cr	0.018 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Zn	0.231 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
	< 0.01 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Ni	0.060 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
As	0.013 mg/L	0.010	10/31/07 856	10/31/07 1530	11/06/07 1548	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/31/07 856	10/31/07 1530	11/02/07 1152	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 11/7/2007

AIR WATER SOIL
LABORATORIES, INC.

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: LEACHATE SAMPLING
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOGLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 x7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE: Charles

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H_2SO_4	BOD 1000ml PLASTIC ICE	TSS 1000ml PLASTIC ICE	METALS (AS, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO_3				COMMENTS Quote I.D.: PH CAL @ 0808 PH=6.88 @ 0903 TEMP= 14.3°C FLOW EST @ 0855 FLOW SECURED @ 1530 PHENOLS POS @ 0905 ADDED FAS TO REMOVE INTERFERENCE PROCEED c̄ PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			10-31-07	0900	1	✓				✓					1							ANALYSIS
2) LEACHATE POND	10-31-07	0856	10-31-07	1530	3		✓			✓						1	1	1				
3)																						SAMPLES POURED
4)																						@1535
5)																						
6)																						ALL SAMPLES
7)																						TRANSPORTED TO
8)																						LAB ON ICE
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles	10-31-07/1600	COURIER	
			11/1/07 1200

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

SPSA-LF
Regional Landfill

07110017
DUE: 5 Days
Recd: 11/01/07

COOLER TEMP 1.5 °C

QC v070329.xls

SPSA-LF
Regional Landfill

07110017
DUE: 5 Days
Recd: 11/01/07

Sample Conditions Checklist

Opened by: (print)

Lab ID No.:

Date Cooler Opened:

(sign)

RECEIVED
NOV 0 1 2007

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

AIR WATER & SOIL
LABORATORIES, INC.

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
Is sample for compliance reporting? YES NO

PROJECT NAME: HRSD MONTHLY LEACHATE +TSS
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample from a chlorinated supply? YES NO
PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS SAMPLER SIGNATURE: Charles
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	TSS 1000ml PLASTIC ICE	METALS (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml PLASTIC HNO3					COMMENTS Quote I.D.: PH CAL @ 0835 PH=7,04 @ 0958 TEMP=17.8°C FLOW STARTED 0952 FLOW SECURED 1430 PHENOLS POS@ 1001 COULD NOT REMOVE INTERFERENCE PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	11-1-07	0958	11-1-07	1430	3		✓			✓					1	1	1					Ē FAS DONOT
2)																						ANALYSIS
3)																						
4)																						SAMPLES POURED
5)																						@ 1430
6)																						
7)																						ALL SAMPLES
8)																						TRANSPORTED ON
9)																						ICE TO LAB
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	11-1-07 / 1542	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			11/02/07 12
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY
COOLER TEMP 2.0 °C JCe
SPSA-LF
Regional Landfill
07110039
DUE: 5 Days
Recd: 11/02/07

J329.xls

AIR WATER SOIL Laboratories, Inc.

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804)

SPSA-LF
Regional Landfill

07110039
DUE: 5 Days
Recd: 11/02/07

Sample Conditions Checklist

Opened by: (print) ____________

Lab ID No.: ____________

Date Cooler Opened: RECEIVED NOV 0 2 2007

(sign) ____________

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice? If yes, what type and temperature? 2.0°C	☑	☐	☐
6.	Was temperature check within acceptable limits?	☑	☐	☐
7.	Were all samples within holding time for requested tests?	☑	☐	☐
8.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
9.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

____

____

____

____

____

____

UNIVERSAL LABORATORIES

20 Research drive, Hampton, Va. 23666

TELEPHONE: (757) 865-0880
FAX: (757) 865-8014
TOLL-FREE: (800) 695-2162

Order ID:: 0711033

(REPORT DATE) 13-Nov-07

REPORT OF ANALYSIS

TO: **Southeastern Public Service Authority**
723 Woodlake Drive
Chesapeake, Va 23327

ATTN: Amy Hardy

Industry Name: Southeastern Public Service Authority
Sample Pt Address:
Location: Leachate Pond Grab.

Industrial Waste Code:
Sample Point Code:
Collected by: CLIENT

UL Project ID: HRSD discharge

Sample ID: LEACHATE POND GRAB.

Orders.Comment:

Leachate Pond Grab.

Parameter	Result	Units	Report Limit	Start Date/ Time	End Date/Time	Analysis Date/Time	Method	Method Reference	Analyst
pH (client provided)	**7.1**	S.U.	0.1			11/2/2007 07:58:00	SM 4500 H/B	18th Edition	C

Leachate Pond Composite

Parameter	Result	Units	Report Limit	Start Date/ Time	End Date/Time	Analysis Date/Time	Method	Method Reference	Analyst
BOD5	**30**	mg/L	2	11/02/07 07:51	11/02/07 11:27	11/3/2007 15:03:00	SM-5210	18th Edition	EG
Total Suspended Solids	**47**	mg/L	1	11/02/07 07:51	11/02/07 11:27	11/7/2007 13:40:00	SM-2540 D	18th Edition	AK
Copper (Total)	**0.027**	mg/L	0.001	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Chromium (Total)	<	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/13/2007 11:01:00	EPA 200.7	40 CFR part 136 App. A	CC
Zinc (Total)	**0.225**	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Lead (Total)	<	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC
Nickel (Total)	<	mg/L	0.005	11/02/07 07:51	11/02/07 11:27	11/9/2007 11:19:00	EPA 200.7	40 CFR part 136 App. A	CC

CHAIN-OF-CUSTODY

UNIVERSAL LABORATORIES

20 Research Drive
Hampton, VA 23666

Phone: (757) 865-0880
Fax: (757) 865-8014

Company
Street/Box
City/State
Phone Fax
Contact:
Job No. / P.O. No.

Sample ID	Date/Time	Sampled By	Matrix	Sample Type	Field Notes	Analysis Required TSS Preservative	BOD Preservative	Metals Preservative	Preservative	Preservative	Preservative	Preservative	Preservative	Log Number
Leachate Pond				C G										0711033
				C G										
				C G										
				C G										
				C G										
				C G										
				C G										
				C G									212.00	
				C G										
				C G										
				C G										
				C G										

Comments:

Cooler Temp at LI 4°C Pres √ <2

Possible Hazards:

Disposal: Lab ☐ Client ☐ Charge ☐

Due Date:
Express Service
Express Service Approval

Relinquished By	Signature	Company SPSA	Date/Time 10-2-07 1517
Received By	Signature	Company UL	Date/Time 10/2/07 1517
Relinquished By	Signature	Company	Date/Time
Received By	Signature	Company	Date/Time
Relinquished By	Signature	Company	Date/Time
Received By	Signature	Company	Date/Time

Work Order No.
Delivery Order
Trans ☐ P.U. ☐ Grab ☐ Comp ☐
Shipping/Delivery Charges
Composite Start / Composite Stop

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 10/22/07 @ 1000
Date / Time

Flow Secured: 10/22/07 @ 1405
Date / Time

pH Meter: Beckman Model 255

Calibration: 10/22/07 @ 0820
Date / Time

Buffer Solutions: 3.99 (Result) 4.00 | 7.00 (Result) 7.00 | 10.00 (Result) 10.00

Slope: 98.1

Calibration Verification: 7.00/7.00
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/22/07 @1010
Date / Time

pH Result: 7.13 @ 14.3 C

Time of Analysis: 1013

Phenols Interference Check: Neg
(Positive or Negative)

1015
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **10/22/07 @ 1004**
Date / Time

Composite Stop: **10/22/07 @ 1410**
Date / Time

Comments:

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill
Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print
Signature

Field Log

Flow Established: 10/23/07 @ 0930 (Date / Time)
Flow Secured: 10/23/07 @ 1349 (Date / Time)

pH Meter: Beckman Model 255
Calibration: 10/23/07 @ 0805 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 | 7.01 (Result) 7.00 | 10.02 (Result) 10.00

Slope: 97.9
Calibration Verification: 7.00/7.00 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond
Sample Collection: 10/23/07 @ 0936 (Date / Time)

pH Result: 7.70 @ 17.4 C
Time of Analysis: 0938

Phenols Interference Check: Positive (Positive or Negative)
0940 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **10/23/07 @ 0932** (Date / Time)
Composite Stop: **10/23/07 @ 1349** (Date / Time)

Comments: Removed interference with FAS.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 10/24/07 @ 0935
Date / Time

Flow Secured: 10/24/07 @ 1330
Date / Time

pH Meter: Beckman Model 255

Calibration: 10/24/07 @ 0648
Date / Time

Buffer Solutions:	4.00	4.00	7.01	7.00	10.02	10.00
	Result		Result		Result	

Slope: 98.0

Calibration Verification: 7.00/7.00
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/24/07 @ 0938
Date / Time

pH Result: 7.51 @ 18.8 C

Time of Analysis: 0943

Phenols Interference Check: Positive
(Positive or Negative)

0945
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: 10/24/07 @ 0935
Date / Time

Composite Stop: 10/24/07 @ 1330
Date / Time

Comments: Removed interference with FAS.

Printed EMS forms are uncontrolled

Check EMS website for current form.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 10/25/07 @ 0940 (Date / Time)

Flow Secured: 10/25/07 @ 1335 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 10/25/07 @ 0600 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 — 7.01 (Result) 7.00 — 10.02 (Result) 10.00

Slope: 98.1

Calibration Verification: 7.00/7.01 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/25/07 @ 0942 (Date / Time)

pH Result: 7.03 @ 18.2 C

Time of Analysis: 0946

Phenols Interference Check: Positive (Positive or Negative)

0948 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **10/25/07 @ 0941** (Date / Time)

Composite Stop: **10/25/07 @ 1335** (Date / Time)

Comments: Removed interference with FAS.

Last Revised 1/30/07

EMS Form 30-LDF HRSD Sampling Worksheet

Printed EMS forms are uncontrolled

Check EMS website for current form.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams (Print)

Signature

Field Log

Flow Established: 10/26/07 @ 0835 (Date / Time)

Flow Secured: 10/26/07 @ 1230 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 10/26/07 @ 0805 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 | 7.00 (Result) 7.00 | 10.01 (Result) 10.00

Slope: 98.9

Calibration Verification: 7.00/7.00 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/26/07 @ 0842 (Date / Time)

pH Result: 7.05 @ 17.0 C

Time of Analysis: 0843

Phenols Interference Check: Neg (Positive or Negative)

0845 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: 10/26/07 @ 0835 (Date / Time)

Composite Stop: 10/26/07 @ 1230 (Date / Time)

Comments:

Last Revised 1/30/07

EMS Form 30-LDF HRSD Sampling Worksheet

Printed EMS forms are uncontrolled

Check EMS website for current form.

HRSD Leachate Sampling Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams (Print)

Signature

Field Log

Flow Established: 10/29/07 @ 0948 (Date / Time)

Flow Secured: 10/29/07 @ 1401 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 10/29/07 @ 0910 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 | 7.00 (Result) 7.00 | 10.01 (Result) 10.00

Slope: 98.7

Calibration Verification: 7.00/7.00 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/29/07 @ 0950 (Date / Time)

pH Result: 7.75 @ 15.4 C

Time of Analysis: 0953

Phenols Interference Check: Neg (Positive or Negative)

0845 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: 10/29/07 @ 0949 (Date / Time)

Composite Stop: 10/29/07 @ 1402 (Date / Time)

Comments:

Last Revised 1/30/07

EMS Form 30-LDF HRSD Sampling Worksheet

Printed EMS forms are uncontrolled

Check EMS website for current form.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 10/30/07 @ 0930 (Date / Time)

Flow Secured: 10/30/07 @ 1358 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 10/30/07 @ 0825 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 — 7.02 (Result) 7.00 — 10.07 (Result) 10.00

Slope: 99.6

Calibration Verification: 7.00/7.00 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/30/07 @ 0934 (Date / Time)

pH Result: 7.11 @ 15.9 C

Time of Analysis: 0937

Phenols Interference Check: Positive (Positive or Negative)

0940 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **10/30/07 @ 0932** (Date / Time)

Composite Stop: **10/30/07 @ 1400** (Date / Time)

Comments: FAS added to phenols to remove interference.

Last Revised 1/30/07

EMS Form 30-LDF HRSD Sampling Worksheet

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 10/31/07 @ 0855
Date / Time

Flow Secured: 10/31/07 @ 1530
Date / Time

pH Meter: Beckman Model 255

Calibration: 10/31/07 @ 0808
Date / Time

Buffer Solutions: 4.00 4.00 | 7.01 7.00 | 10.05 10.00
Result | Result | Result

Slope: 99.5

Calibration Verification: 7.00/7.01
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 10/31/07 @ 0900
Date / Time

pH Result: 6.88 @ 14.3 C

Time of Analysis: 0903

Phenols Interference Check: Positive
(Positive or Negative)

0905
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **10/31/07 @ 0856**
Date / Time

Composite Stop: **10/31/07 @ 1530**
Date / Time

Comments: Added FAS to remove interference. pH cal method: pH value (4500- H^+-B)/ Eletrometric Method.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams (Print)

Charles E. (Signature)

Field Log

Flow Established: 11/1/07 @ 0952 (Date / Time)

Flow Secured: 11/1/07 @ 1430 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 11/1/07 @ 0835 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 | 7.02 (Result) 7.00 | 10.03 (Result) 10.00

Slope: 98.8

Calibration Verification: 7.00/7.02 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 11/1/07 @ 0955 (Date / Time)

pH Result: 7.04 @ 17.8 C

Time of Analysis: 0958

Phenols Interference Check: Positive (Positive or Negative)

1001 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **11/01/07 @ 0952** (Date / Time)

Composite Stop: **11/01/07 @ 1430** (Date / Time)

Comments: Added FAS to remove interference for phenols, but could not remove interference-do not analyze. pH cal method: pH value (4500- H+-B)/Eletrometric Method.

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 11/02/07 @ 0751
Date / Time

Flow Secured: 11/02/07 @ 1127
Date / Time

pH Meter: Beckman Model 255

Calibration: 11/02/07 @ 0630
Date / Time

Buffer Solutions:	4.00 4.00	7.02 7.00	10.00 10.00
	Result	Result	Result

Slope: 99.8

Calibration Verification: 7.00/7.01
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 11/2/07 @ 0754
Date / Time

pH Result: 7.08 @ 14.8 C

Time of Analysis: 0758

Phenols Interference Check: Positive
(Positive or Negative)

0800
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **11/02/07 @ 0752**
Date / Time

Composite Stop: **11/02/07 @ 1127**
Date / Time

Comments: Added FAS to remove interference for phenols, but could not remove interference-do not analyze. pH cal method: ph value (4500-H$^+$-B)/Eletrometric Method

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	October 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	November 9, 2007
Certified Reports:	Mailed November 13, 2007
Number of Pages:	6

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087 Acct# 4178540009	Monthly leachate: Monthly pH/ Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087 Acct# 4178540009	Leachate disposal quantities	Not Applicable

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station   Account No. 3473040009

Service Location 3136 Woodland Drive   City Norfolk

Circle One

Meter S/N 99824707   Date Read 10/31/07   Reading* 322790   CF [✓ GAL]

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

Meter S/N ______   Date Read ___/___/___   Reading* ______   CF GAL

*Indicate stationary zeros (<u>00</u>) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy   Title Environmental Compliance Coordinator
(printed)

Signature Amy E. Hardy   Date 11-1-07

Revised 06/11/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name:	Southeastern Public Service Authority
Sample Point Address:	#1 Bob Foeller Drive, Suffolk, VA.
Location:	Regional Landfill (Permit # 0087)
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.87	-----	<5.0	10-01-07 09:56	10-01-07 10:00	EPA 4500-H^+B	CEW

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 11/9/07

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100040

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07100040-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.14 mg/L	0.05	10/01/07 954	10/03/07 1010	EPA420.1	RPF

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Signature:
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 10/9/2007

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07100040

Industry Name:	SPSA
Sample Pt. Address:	Regional Landfill
Sample Pt. Location:	Leachate Pond
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

Laboratory Sample I.D.: 07100040-002

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	8.2 mg/L	2.0	10/01/07 952	10/01/07 1454	10/03/07 1150	SM5210B	RPF
Cu	0.058 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
Cr	0.019 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
Zn	0.291 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
	0.070 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
As	< 0.01 mg/L	0.010	10/01/07 952	10/01/07 1454	10/09/07 1424	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	10/01/07 952	10/01/07 1454	10/05/07 1128	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 10/9/2007

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy Hardy
CLIENT ADDRESS: 1 Bob Foeller Dr. Suffolk VA
CLIENT PHONE NUMBER: 757-539-9373 x 7
CLIENT FAX NUMBER: 757-539-9379
Is sample for compliance reporting? [✓ YES] NO

PROJECT NAME: HRSD Leachate
SITE NAME: Regional Landfill
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): Charles Williams
SAMPLER SIGNATURE: Charles
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	Phenols 1000 ml Amber H_2SO_4	BOD 1000ml plastic ice	metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) 500ml plastic HNO_3				All samples transported to lab on ice	COMMENTS Quote I.D.: pH cal @0800 pH = 7.97@1000. Flow started 0950 Flow secured @ 1455 Phenols pos. for interference @1003 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) Leachate Pond	cow ~~10-1-07~~		10-1-07	0956	1	✓			✓						1							Added FAS
2) Leachate Pond	10-1-07	0952	10-1-07	1456	2		✓		✓							1	1					to remove
3)																						interference
4)																						proceed with
5)																						analysis
6)																						
7)																						Samples
8)																						poured @
9)																						1500
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	10-1-07 / 1500	Courier	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
			10/02/07 1030
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level I ☐
Level II ☐
Level III ☐

LAB USE ONLY
SPSA-LF
Regional Landfill

COOLER TEMP 2.1 °C
07100040
DUE: 5 Day
Recd: 10/02/0

AIR WATER & SOIL
Laboratories, In

2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 3

SPSA-LF
Regional Landfill

07100040
DUE: 5 Days
Recd: 10/02/07

Sample Conditions Checklist

Opened by: (print)

Lab ID No.:

Date Cooler Opened: RECEIVED OCT 0 2 2007

(sign)

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice? If yes, what type and temperature? 2.1 °C	☑	☐	☐
6.	Was temperature check within acceptable limits?	☑	☐	☐
7.	Were all samples within holding time for requested tests?	☑	☐	☐
8.	Are all samples,in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
9.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month OCT Year 2007

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	6185677	119522	17	6452413	0
2	6185677	0	18	6452413	0
3	6185677	0	19	6522864	70451
4	6185677	0	20	6522864	0
5	6185677	0	21	6522864	0
6	6185677	0	22	6591242	68378
7	6185677	0	23	6666357	75115
8	6296226	110549	24	6734620	68263
9	6296226	0	25	6798104	63484
10	6296226	0	26	6875778	77674
11	6379364	83138	27	6875778	0
12	6379364	0	28	6875778	0
13	6379364	0	29	6962219	86441
14	6379364	0	30	7040427	78208
15	6452413	73049	31	7150069	109642
16	6452413				

Monthly Total: 1083914 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. §1319. (Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.

Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 11-8-07

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

TRANSMISSION VERIFICATION REPORT

TIME : 11/09/2007 16:12
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	11/09 16:10
FAX NO./NAME	4643985
DURATION	00:01:37
PAGE(S)	06
RESULT	OK
MODE	STANDARD ECM

SOUTHEASTERN PUBLIC SERVICE AUTHORITY SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	AMENDED PER HRSD INSPECTION 10-26-07
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	November 5, 2007
Certified Reports:	Mailed November 6, 2007
Number of Pages:	8

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report/Parameters	Violations to Report
Regional Landfill	0087 Acct# 4178540009	AMENDED monthly pH/phenols (if applicable) reports: 7-07 thru 9-07	Not Applicable
Regional Landfill	0087 Acct# 4178540009	AMENDED 5-22-07 AWS Sampling Checklist with AWS cover letter	None
Regional Landfill	0087 Acct# 4178540009	AMENDED 8-29-07 Chain of Custody	None
Regional Landfill	0087 Acct# 4178540009	UPDATED Signatory Authorization Form	None

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 11/5/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name:	Southeastern Public Service Authority
Sample Point Address:	#1 Bob Foeller Drive, Suffolk, VA.
Location:	Regional Landfill (Permit # 0087)
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.56	-----	<5.0	07-03-07 10:02	07-03-07 10:05	EPA 4500-H^+B	CEW
Total Phenols	----	mg/l	0.021	07-03-07 10:02	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

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Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 11/5/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name: Southeastern Public Service Authority
Sample Point Address: #1 Bob Foeller Drive, Suffolk, VA.
Location: Regional Landfill (Permit # 0087)

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.67	-----	<5.0	09-04-07 10:07	09-04-07 10:10	EPA 4500-H^+B	CEW
Total Phenols	----	mg/l	0.021	09-04-07 10:07	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 11/5/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name:	Southeastern Public Service Authority
Sample Point Address:	#1 Bob Foeller Drive, Suffolk, VA.
Location:	Regional Landfill (Permit # 0087)
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.45	-----	<5.0	08-01-07 10:18	08-01-07 10:20	EPA 4500-H^+B	CEW
Total Phenols	----	mg/l	0.021	08-01-07 10:18	Unable to remove interference, could not analyze	EPA 420.1	CEW

CERTIFICATION STATEMENT

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Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 11/5/07

AIR WATER & SOIL Laboratories, Inc.
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel : (804) 358-8295 Fax: (804) 358-8297

November 01, 2007

SPSA
Attn: Amy Hardy
723 Woodlake Drive
Chesapeake, VA 23320

RE: May 01, 2007 Regional Landfill Leachate Pond HRSD Outfall Event Sample Conditions Checklist

Dear Mrs. Hardy:

I would like to address the issue of the Sample Conditions Checklist for AWS Order ID 07050042 brought up during your October 30, 2007 HRSD inspection.

I must apologize for the poor wording of question six of the Sample Conditions Checklist form. At first glance, the question "If yes (Was the sample received on ice?), was there a temperature blank and was the temperature less than 4 degrees Celsius?" leads many people (including me) to interpret a "No" response as being not in compliance. It was pointed out to me that in a case where the sample was received on ice and no temperature blank container was included in the cooler, the correct response to the question is "No". Air Water and Soil places a temperature blank container in coolers when only VOA vials are being sampled. When other types of sample containers are provided, a discrete temperature blank container may or may not be provided. The temperature of the cooler may be determined from one of the actual sample containers as was the case with samples in Order ID 07050042. The temperature measured from one of the sample containers was notated on the Chain of Custody form as being 2.9 °C.

I have attached a revised copy of the Sample Conditions Checklist for Order ID 07050042 with additional remarks explaining the true disposition of the samples when they were received. I hope this documentation is sufficient for your records. If you would like me to provide further discussion, please let me know.

We are in the process of reviewing and revising the Sample Conditions Checklist. The new form is not in service as of this date; however you should see it accompanying your Certificates of Analysis in the near future.

Sincerely

Emile T Shaw

Emile Shaw
Quality Assurance Officer
Air Water & Soil Laboratories, Inc.

Attachment

AIR WATER & SOIL Laboratories, Inc.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373
CLIENT FAX NUMBER: 757-539-9379
Is sample for compliance reporting? [✓ YES] NO

PROJECT NAME: CN- RESAMPLE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample from a chlorinated supply? YES [✓ NO]
PWS#

SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles
Turn Around Time: RUSH 8? Day(s) per Amy Hardy 8/31/07

CLIENT SAMPLE I.D.	Date Sampled	Time Sampled	Number of Containers	MATRIX: Grab	Composite	Field Filtered	Groundwater	Wastewater	Drinking Water	Soil	Solids	Other	ANALYSIS: CN- 250 ML PLASTIC NaOH							COMMENTS
1) LEACHATE POND	8-27-07	1125	1	✓				✓					1							ALL SAMPLES TRANSPORTED TO LAB ON ICE
2) Leachate Pond	8-28-07	927	1	✓				✓					1							
3) LEACHATE POND	8-29-07 ~~8-28-07~~ CW	0903	1	✓				✓					1							
4)																				PLEASE NOTE PRESERVATIVE(S)
5)																				
6)																				
7)																				
8)																				
9)																				
0)																				

INQUISHED: Charles
DATE / TIME 8-29-07 / 1530
RECEIVED: Jessica
DATE / TIME 8/31/07 1615

INQUISHED:
DATE / TIME
RECEIVED:
DATE / TIME

NQUISHED:
DATE / TIME
RECEIVED:
DATE / TIME

LAB USE ONLY
COOLER TEMP °C 2.2°C
SPSA-LF
07080468
DUE: 5 Days

HAMPTON ROADS SANITATION DISTRICT

SIGNATORY AUTHORIZATION

INDUSTRY NAME	SPSA Regional Landfill		
INDUSTRY LOCATION	#1 Bob Foeller Drive, Suffolk, VA 23434		
PERMIT NUMBER(S)	0087	IWD CODE (To be completed by HRSD)	

Previously submitted Signatory Authorizations cannot be amended. Receipt of this form automatically revokes any (all) previous authorization(s). Therefore, please LIST ALL CURRENT AUTHORIZED REPRESENTATIVES below. Use additional sheets if necessary.

AUTHORIZED REPRESENTATIVE(S)

This representative must be either an individual or position having responsibility for the overall operation of the facility, or an individual/position of equivalent responsibility, or an individual/position having overall responsibility for environmental matters for the company.

1. NAME (Print)	Scott Whitehurst	4. NAME (Print)	
TITLE	Superintendent of Environmental Management	TITLE	
SIGNATURE	Scott D W	SIGNATURE	
2. NAME (Print)	Amy Hardy	5. NAME (Print)	
TITLE	Environmental Compliance Coordinator	TITLE	
SIGNATURE	Amy E. Hardy	SIGNATURE	
3. NAME (Print)	Tanya C. Bray	6. NAME (Print)	
TITLE	Technical Research Analyst	TITLE	
SIGNATURE	Tanya C Bray	SIGNATURE	

APPROVAL AUTHORITY

The person signing this approval must be a president, secretary, treasurer, vice president (Base or Installation Commanding Officer or Vice-Commanding Officer) or any other person who performs similar policy or decision-making functions for the corporation; be a general partner or proprietor if a partnership or sole proprietorship. See 40 CFR Part 403.12 for additional information.

The approval authority below shall be considered an authorized representative and need not be listed above.

NAME (Print)	Richard M. Cheliras	TITLE	Director of Waste-to-Energy
SIGNATURE		DATE	11-2-07

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	September 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	October 10, 2007
Certified Reports:	Mailed October 10, 2007
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087	Monthly leachate: SPSA Sampling Field Log Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087	Leachate disposal quantities	Not Applicable

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy　　Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy　　Date: 10/10/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station Account No. 3473040009

Service Location 3136 Woodland Drive City Norfolk

Circle One

Meter S/N 99824707 Date Read 9/28/07 Reading* 320030 CF [✓ GAL]
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL
Meter S/N ____ Date Read __/__/__ Reading* ____ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy
(printed)
Title Environmental Compliance Coordinator

Signature Amy E. Hardy
Date 10/3/07

Revised 06/11/07

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07090040

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07090040-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	11.1 mg/L	2.0	09/04/07 1001	09/04/07 1330	09/06/07 1710	SM5210B	CLT
Cu	0.019 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
Cr	0.014 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
Zn	0.099 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
Pb	< 0.01 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
N	0.054 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
Cd	< 0.01 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
As	< 0.01 mg/L	0.010	09/04/07 1001	09/04/07 1330	09/12/07 1431	EPA200.7	CGT
Hg	< 0.0002 mg/L	0.0002	09/04/07 1001	09/04/07 1330	09/07/07 940	EPA245.1	DMH

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 9/12/2007

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy Hardy
CLIENT ADDRESS: 1 Bob Foeller Dr Suffolk VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
Is sample for compliance reporting? [✓ YES] NO

PROJECT NAME: HRSD Leachate
SITE NAME: Regional Landfill
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:

Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:

SAMPLER NAME (PRINT): Charles Williams
SAMPLER SIGNATURE:
Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml Plastic ICE	Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) HNO3 500ml Plastic					All samples transported to lab on ice	Quote I.D.: pH cal @ 0815 pH = 7.67@ 1000 Phenols pos. for interference added FeS to total absorption could not remove interference Grab time @ 1007 * PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) Leachate Pond	9-4-07	1001	9-4-07	1330	2		✓			✓					1	1						composite
2)																						pour @ 1332
3)																						
4)																						Flow start @
5)																						1000
6)																						Flow secured
7)																						@ 1330
8)																						
9)																						Ice
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	9-4-07/1435		9/6/07 0930

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

SPSA-LF
Regional Landfill

07090040
DUE: 5 Day
Recd: 09/06/0

COOLER TEMP 3.5 °C

SPSA-LF
Regional Landfill

07090040
DUE: 5 Days
Recd: 09/06/07

Sample Conditions Checklist

Opened by: (print) Jw

Lab ID No.:

Date Cooler Opened: RECEIVED SEP 06 2007

(sign) Jw

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☑	☐	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice? If yes, what type and temperature? 3.5	☑	☐	☐
6.	Was temperature check within acceptable limits?	☑	☐	☐
7.	Were all samples within holding time for requested tests?	☑	☐	☐
8.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
9.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams (Print)

Signature

Field Log

Flow Established: 9-4-2007 @ 1000 (Date / Time)

Flow Secured: 9-4-2007 @ 1330 (Date / Time)

pH Meter: Beckman Model 255

Calibration: 9-4-2007 @ 0815 (Date / Time)

Buffer Solutions: 4.00 (Result) 4.00 | 7.02 (Result) 7.00 | 10.01 (Result) 10.00

Slope: 97.3

Calibration Verification: 7.00/7.01 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 9-4-2007 @ 1007 (Date / Time)

pH Result: 7.67

Time of Analysis: 1010

Phenols Interference Check: Positive (Positive or Negative)

1012 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **9-04-2007 @ 1001** (Date / Time)

Composite Stop: **9-4-2007 @ 1330** (Date / Time)

Comments: Added FAS to total absoption but could not remove interference from phenols.

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month SEPTEMBER Year 2007

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	5668858	0	17	5919935	0
2	5668858	0	18	5919935	0
3	5668858	0	19	5919935	0
4	5742805	73947	20	5919935	0
5	5742805	0	21	5919935	0
6	5742805	0	22	6066155	146220
7	5742805	0	23	6066155	0
8	5886392	143587	24	6066155	0
9	5919935	33543	25	6066155	0
10	5919935	0	26	6066155	0
11	5919935	0	27	6066155	0
12	5919935	0	28	6066155	0
13	5919935	0	29	6066155	0
14	5919935	0	30	6066155	0
15	5919935	0	31		
16	5919935	0			

Monthly Total: 397297 Gallons

Certification Statement

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Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 10-1-07

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	August 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	AMENDED October 1, 2007
Certified Reports:	Mailed AMENDED October 1, 2007
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087	Monthly leachate: SPSA Sampling Field Log (AMENDED) Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087	Leachate disposal quantities	Not Applicable

CERTIFICATION STATEMENT

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Name: Amy E. Hardy Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy Date: 10/1/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station Account No. 3473040009

Service Location 3136 Woodland Drive City Norfolk

Circle One

Meter S/N 99824707 Date Read 8/31/07 Reading* 317620 CF [✓ GAL]

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy **Title** Environmental Compliance Coordinator
(printed)

Signature Amy E. Hardy **Date** 9-7-07

Revised 06/11/07

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 08/01/07 @ 1015
Date / Time

Flow Secured: 08/01/07 @ 1415
Date / Time

pH Meter: Beckman Model 255

Calibration: 08/01/07 @ 0810
Date / Time

Buffer Solutions: 4.00 4.00 7.00 7.00 10.01 10.00
Result Result Result

Slope: 99.6

Calibration Verification: 7.00/7.00
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 08/01/07 @ 1018
Date / Time

pH Result: 7.45

Time of Analysis: 1020

Phenols Interference Check: Positive
(Positive or Negative)

1023
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: 08/01/07 @ 1015
Date / Time

Composite Stop: 08/01/07 @ 1415
Date / Time

Comments: Added FAS to phenols to total absorption. Could not remove interference.

AIR WATER & SOIL
LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07080028

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07080028-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	19.1 mg/L	2.0	08/01/07 1015	08/01/07 1420	08/03/07 1714	SM5210B	TER
Cu	0.022 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Cr	0.011 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Zn	0.103 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Pb	< 0.01 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Ni	0.052 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Cd	< 0.01 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
As	0.021 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Hg	< 0.0002 mg/L	0.0002	08/01/07 1015	08/01/07 1420	08/08/07 1129	EPA245.1	CGT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 8/9/2007

TRANSMISSION VERIFICATION REPORT

```
TIME   : 10/01/2007 10:25
NAME   : SPSA_STS
FAX    : 7575391651
TEL    : 7575391651
SER.#  : 000K5J889534
```

```
DATE,TIME                 10/01  10:23
FAX NO./NAME              4643985
DURATION                  00:01:29
PAGE(S)                   05
RESULT                    OK
MODE                      STANDARD
                          ECM
```

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	August 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	September 11, 2007
Certified Reports:	Mailed September 11, 2007
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Regional Landfill	0087	Cyanide Samples	Not Applicable

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E Hardy
Date: 9/11/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

Certification Statement

For Reports or Information Submitted to HRSD

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Signature: Amy E. Hardy

Title: Environmental Compliance Coordinator

Date: 9-11-07

AIR WATER & SOIL Laboratories, Inc.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: CN- RESAMPLE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? [✓ YES] NO

Is sample from a chlorinated supply? YES [✓ NO]

PWS#

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: RUSH 8 Day(s) per Amy Hardy 8/31/07

								MATRIX					ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Date Sampled	Time Sampled	Number of Containers	Grab	Composite	Field Filtered	Groundwater	Wastewater	Drinking Water	Soil	Solids	Other	CN- 250 ML PLASTIC NaOH							ALL SAMPLES TRANSPORTED TO LAB ON ICE PLEASE NOTE PRESERVATIVE(S)
1) LEACHATE POND	8-27-07	1125	1	✓				✓					1							
2) Leachate Pond	8-28-07	927	1	✓				✓					1							
3) LEACHATE POND	8-29-07	0903	1	✓				✓					1							
4)																				
5)																				
6)																				
7)																				
8)																				
9)																				
10)																				

RELINQUISHED:	DATE / TIME 8-29-07 / 1530	RECEIVED:	DATE / TIME 8/31/07 1615
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

LAB USE ONLY

COOLER TEMP °C 2.2°C

SPSA-LF

07080468

DUE: 5 Days
Recd: 08/30/07

Sample Conditions Checklist

Opened by: (print) C. Tombes
Lab ID No.: 07080468
Date Cooler Opened: 8-30-07
(sign) Carmela Tombes

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice? If yes, what type and temperature? 2.2 °C	☑	☐	☐
6.	Was temperature check within acceptable limits?	☑	☐	☐
7.	Were all samples within holding time for requested tests?	☑	☐	☐
8.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
9.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

TRANSMISSION VERIFICATION REPORT

TIME : 09/11/2007 08:04
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	09/11 08:03
FAX NO./NAME	4643985
DURATION	00:01:18
PAGE(S)	05
RESULT	OK
MODE	STANDARD ECM

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Certificate of Analysis

Final Report

Laboratory Order ID 07080468

Client Name:	SPSA 723 Woodlake Drive Chesapeake, VA 23320	Date Received: Date Issued:	August 30, 2007 September 04, 2007
Submitted To:	Amy Hardy	Project Number:	NA
Client Site I.D.:		Purchase Order:	4500024514

Sample I.D.: Leachate Pond 8-27 Laboratory Sample I.D.: 07080468-001

Date/Time Sampled 08/27/07 11:25

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.09 mg/L	0.01	09/04/07 0:00	RPF

Sample I.D.: Leachate Pond 8-28 Laboratory Sample I.D.: 07080468-002

Date/Time Sampled 08/28/07 09:27

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.10 mg/L	0.01	09/04/07 0:00	RPF

Sample I.D.: Leachate Pond 8-29 Laboratory Sample I.D.: 07080468-003

Date/Time Sampled 08/29/07 09:03

Parameter	Method	Sample Results	Rep Limit	Analysis Date/Time	Analyst
Cyanide	Kelada-01	0.11 mg/L	0.01	09/04/07 0:00	RPF

Ted Soyars

Laboratory Manager

AIR WATER & SOIL Laboratories, Inc.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK
CLIENT PHONE NUMBER: 757-539-9373
CLIENT FAX NUMBER: 757-539-9379
PROJECT NAME: CN- RESAMPLE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024514
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS#
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles L. W
Turn Around Time: RUSH 8°C Day(s) per Amy Hardy 8/31/07

COMMENTS: ALL SAMPLES TRANSPORTED TO LAB ON ICE

								MATRIX					ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Date Sampled	Time Sampled	Number of Containers	Grab	Composite	Field Filtered	Groundwater	Wastewater	Drinking Water	Soil	Solids	Other	CN- 250 ML PLASTIC NaOH							PLEASE NOTE PRESERVATIVE(S)
1) LEACHATE POND	8-27-07	1125	1	✓				✓					1							
2) Leachate Pond	8-28-07	927	1	✓				✓					1							
3) LEACHATE POND	8-2-97	0903	1	✓				✓					1							
4)																				
5)																				
6)																				
7)																				
8)																				
9)																				
10)																				

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles L. W	8-29-07 / 1530	Jessica J. Campbell	8/31/07 / 1615
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

LAB USE ONLY
COOLER TEMP °C 2.2°C
SPSA-LF
07080468
DUE: 5 Days
Recd: 08/30/

Sample Conditions Checklist

Opened by: (print) C. Tombes

Lab ID No.: 07080468

Date Cooler Opened: 8-30-07

(sign) Carmela Tombes

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice? If yes, what type and temperature? 2.2 °C	☑	☐	☐
6.	Was temperature check within acceptable limits?	☑	☐	☐
7.	Were all samples within holding time for requested tests?	☑	☐	☐
8.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
9.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	August 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	September 10, 2007
Certified Reports:	Mailed September 10, 2007
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087	Monthly leachate: SPSA Sampling Field Log Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087	Leachate disposal quantities	Not Applicable

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E. Hardy
Date: 9/10/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS
SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station Account No. 3473040009

Service Location 3136 Woodland Drive City Norfolk

Circle One

Meter S/N 99824707 Date Read 8/31/07 Reading* 317620 CF [✓ GAL]

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

Meter S/N______ Date Read ___/___/___ Reading*______ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy
(printed)

Title Environmental Compliance Coordinator

Signature Amy E. Hardy

Date 9-7-07

Revised 06/11/07

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Laboratory Order ID: 07080028

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07080028-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	19.1 mg/L	2.0	08/01/07 1015	08/01/07 1420	08/03/07 1714	SM5210B	TER
Cu	0.022 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Cr	0.011 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Zn	0.103 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Pb	< 0.01 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
	0.052 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Cd	< 0.01 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
As	0.021 mg/L	0.010	08/01/07 1015	08/01/07 1420	08/08/07 1403	EPA200.7	DMH
Hg	< 0.0002 mg/L	0.0002	08/01/07 1015	08/01/07 1420	08/08/07 1129	EPA245.1	CGT

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Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 8/9/2007

AIR WATER & SOIL Laboratories, Inc.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: Amy Hardy
CLIENT ADDRESS: 1 Bob Foeller Dr. Suffolk
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-9379
PROJECT NAME: HRSD Monthly Leachate
SITE NAME: Regional Landfill
PROJECT NUMBER:
P.O. NUMBER: 4500029514
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS#
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE: Charles
Turn Around Time: Day(s)

CLIENT SAMPLE I.D.	Date Sampled	Time Sampled	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml Plastic ice	Metals (As, Cd, Cu, Cr, Pb, Hg, Ni, Zn) 800ml Plastic HNO3					ALL SAMPLES TRANSFERRED TO LAB ON ICE	COMMENTS 7H CAL @0810 pH = 7.45 @1020 FLOW EST @1015 COMPOSITE STARTED 1015 GRAB TIME @1015 FLOW SECURED @ 1415 COMPOSITE STOP @ 1415 PLEASE NOTE PRESERVATIVE(S)
1) Leachate Pond	8-1-07	1420	2		✓			✓					1	1						PHENOLS
2)																				POSD 1023
3)																				ADDED FAS TO
4)																				TOTAL ABSORPTI
5)																				COULD NOT
6)																				REMOVE
7)																				INTERFERENCE
8)																				DO NOT
9)																				ANALYSIS
10)																				

SPSA-Hardy 07080028
Regional Landfill
DUE: 5 Days
Recd: 08/02/07

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
Charles	8-1-07/1405	COURIER	
RELINQUISHED:	DATE / TIME	RECEIVED: Jessica Campbell	DATE / TIME 8/2/07 1230
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

LAB USE ONLY

COOLER TEMP °C 0 ICE

07080028

SPSA-Hardy **07080028**
Regional Landfill DUE: 5 Days
Recd: 08/02/07

Sample Conditions Checklist

Opened by: (print) Jessica Comstock **Lab ID No.:**

Date Cooler Opened: 8/2/07 **(sign)**

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month August Year 2007

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	4813000	66489	17	5225498	112886
2	4813000	0	18	5225498	0
3	4881711	68711	19	5225498	0
4	4881711	0	20	5225498	0
5	4881711	0	21	5225498	0
6	4964212	82501	22	5327739	102241
7	4964212	0	23	5466784	139045
8	4964212	0	24	5551634	84850
9	4964212	0	25	5551634	0
10	4964212	0	26	5551634	0
11	4964212	0	27	5574907	23273
12	4964212	0	28	5596798	21891
13	5112612	148400	29	5613052	16254
14	5112612	0	30	5613052	0
15	5112612	0	31	5668858	55806
16	5112612	0			

Monthly Total: 922347 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. §1319. (Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.

Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 9-10-07

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	July 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	August 10, 2007
Certified Reports:	Mailed August 10, 2007
Number of Pages:	5

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report	Violations to Report
Norfolk Transfer Station	Acct# 3473040009	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087	Monthly leachate: SPSA Sampling Field Log Air, Water, & Soil Laboratories COA	None
Regional Landfill	0087	Leachate disposal quantities	Not Applicable

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E. Hardy
Date: 8/10/07

If this transmission is not received in its entirety, please call Amy Hardy 539-9373, ext. 7

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT

HRSD
PRETREATMENT & POLLUTION PREVENTION DIVISION
P. O. BOX 5902
VIRGINIA BEACH, VA 23471-0902
FAX (757) 464-3985

SPECIAL METER READINGS REPORT

The following information provided certifies the volume of water registered on the inspected meter. All information given shall be subject to the established policies of HRSD.

Customer Name Southeastern Public Service Authority Norfolk Transfer Station   Account No. 3473040009

Service Location 3136 Woodland Drive   City Norfolk

Circle One

Meter S/N 99824707 Date Read 7/31/07 Reading* 31440 CF [✓ GAL]

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

Meter S/N ____ Date Read ___/___/___ Reading* ____ CF GAL

*Indicate stationary zeros (00) or multiplier (x100) if applicable.

Meters are to be read during the last 10 days of every month. Readings must be received in our office by the 10th of the following month.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name Amy E. Hardy
(printed)

Title Environmental Compliance Coordinator

Signature Amy E. Hardy

Date 8-1-07

Revised 06/11/07

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill

Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print

Signature

Field Log

Flow Established: 7-3-07 @ 1000
Date / Time

Flow Secured: 7-3-07 @ 1403
Date / Time

pH Meter: Beckman Model 255

Calibration: 7-3-07 @ 0850
Date / Time

Buffer Solutions:	4.00 4.00	7.01 7.00	10.04 10.00
	Result	Result	Result

Slope: 98.3

Calibration Verification: 7.00/7.00
Buffer / Result

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond

Sample Collection: 7-3-07 @ 1002
Date / Time

pH/Temp Result: $7.56 / 25.5^{\circ}C$

Time of Analysis: 1005

Phenols Interference Check: Positive
(Positive or Negative)

1008
Time Performed

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **7/3/07 @ 1000**
Date / Time

Composite Stop: **7/3/07 @ 1403**
Date / Time

Comments: Could not remove interference from phenols sample. Did not have phenols analysised. Composite samples poured at 1406.

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LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07070036

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07070036-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	24.1 mg/L	2.0	07/03/07 1000	07/03/07 1403	07/05/07 1620	SM5210B	RPF
Cu	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Cr	0.011 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Zn	0.058 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Pb	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
	0.045 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Cd	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
As	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Hg	< 0.0002 mg/L	0.0002	07/03/07 1000	07/03/07 1403	07/09/07 1258	EPA245.1	CGT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 7/13/2007

TRANSMISSION VERIFICATION REPORT

TIME : 08/10/2007 14:12
NAME : SPSA_STS
FAX : 7575391651
TEL : 7575391651
SER.# : 000K5J889534

DATE,TIME	08/10 14:10
FAX NO./NAME	4643985
DURATION	00:01:27
PAGE(S)	05
RESULT	OK
MODE	STANDARD ECM

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Laboratory Order ID: 07070036

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07070036-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	24.1 mg/L	2.0	07/03/07 1000	07/03/07 1403	07/05/07 1620	SM5210B	RPF
Cu	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Cr	0.011 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Zn	0.058 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Pb	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
[illegible]	0.045 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Cu	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
As	< 0.01 mg/L	0.010	07/03/07 1000	07/03/07 1403	07/13/07 1422	EPA200.7	DMH
Hg	< 0.0002 mg/L	0.0002	07/03/07 1000	07/03/07 1403	07/09/07 1258	EPA245.1	CGT

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Signature: Ted
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 7/13/2007

AIR WATER & SOIL LABORATORIES, INC.

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RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA	PROJECT NAME: HRSD MONTHLY LEACHATE
CLIENT CONTACT: AMY HARDY	SITE NAME: REGIONAL LANDFILL
CLIENT ADDRESS: 1 BOB FOELLER DR SUFFOLK VA	PROJECT NUMBER:
CLIENT PHONE NUMBER: 757-539-9373 EXT: 7	P.O. NUMBER: 4500024514
CLIENT FAX NUMBER: 757-539-9379	REGULATORY AUTHORITY:

Is sample for compliance reporting? YES NO

Is sample from a chlorinated supply? YES NO

PWS I.D. #:

SAMPLER NAME (PRINT): CHARLES WILLIAMS

SAMPLER SIGNATURE:

Turn Around Time: Day(s)

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

						MATRIX									ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	BOD 1000ml PLASTIC ICE	METALS (AS, CD, CR, CU, PB, HG, NI, ZN) 500ml PLASTIC HNO3						Quote I.D.: PH COC @0950 PH= 7.56 @1005 TEMP= 26.0°C FLOW 1ST @1000 FLOW SECOND @ 1403 PHENOLS POS. FOR INTERFENCE @1008 FAS ADDED UNTIL PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND	7-3-07	1000	7-3-07	1403	2		✓			✓					1	1						TOTAL ABSORPTION
2)																						COULD NOT
3)																						REMOVE
4)																						INTERFERENCE
5)																						DO NOT
6)																						ANALYSIS
7)																						
8)																						SAMPLES
9)																						POURED @1400
10)																						

RELINQUISHED:	DATE / TIME 7-3-07/	RECEIVED: COURIER	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐
- Level IV ☐

LAB USE ONLY

SPSA-Hardy
Regional Landfill

07070036
DUE: 5 Days
Recd: 07/05/07

COOLER TEMP ICE °C
3°C

v070329.xls

SPSA-Hardy
Regional Landfill

07070036
DUE: 5 Days
Recd: 07/05/07

Sample Conditions Checklist

Opened by: (print)

Lab ID No.:

Date Cooler Opened: RECEIVED JUL 05 2007

(sign)

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☐	☑	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☐	☐	☑
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month July Year 2007

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	4365279	0	17	4484710	0
2	4365279	0	18	4484710	0
3	4434767	69,488	19	4484710	0
4	4434767	0	20	4575030	90320
5	4434767	0	21	4575030	0
6	4434767	0	22	4575030	0
7	4434767	0	23	4681059	106029
8	4434767	0	24	4681059	0
9	4434767	0	25	4681059	0
10	4434767	0	26	4681059	0
11	4434767	0	27	4681059	0
12	4434767	0	28	4681059	0
13	4484710	49943	29	4681059	0
14	4484710	0	30	4746511	65452
15	4484710	0	31	4746511	0
16	4484710	0			

Monthly Total: 381232 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. §1319. (Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.

Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 8-3-07

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
SPSA
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

SPSA SELF MONITORING REPORTS

Reports for:	June 2007
Submitted by:	Amy E. Hardy
Submitted to:	Hampton Roads Sanitation District
Fax Number:	464-3985
Date Faxed:	July 9, 2007
Certified Reports:	Mailed July 9, 2007
Number of Pages:	4

REPORTS SUBMITTED

Facility Name	HRSD Permit #	Type of Report/Parameters	Violations to Report
Norfolk Transfer Station	Acct# 0019633500	Special Meter Reading- Meter # 94007954	Not Applicable
Regional Landfill	0087	Monthly leachate/ pH; phenols; BOD; Cd; Cr; Cu; Pb; Hg; Ni; Zn; As	None
Regional Landfill	0087	Leachate disposal quantities	None

If this transmission is not received in its entirety, please call Amy Hardy 420-4700.

P.O. Box 1346
Chesapeake, VA 23320-1346

HAMPTON ROADS SANITATION DISTRICT
Industrial Waste Division
P.O. Box 5911
Virginia Beach, VA 23455-0911
Fax (757) 464-3985

SPECIAL METER READINGS REPORT

THE FOLLOWING INFORMATION PROVIDED CERTIFIES THE VOLUME OF WATE REGISTERED ON THE INSPECTED METER. ALL INFORMATION GIVEN SHALL BE SUBJECT TO THE ESTABLISHED POLICIES OF THE DISTRICT.

CUSTOME NAME Southeastern Public Service Authority ACCT 0019633500

SERVICE LOCATION Norfolk Transfer Station 3136 Woodland Drive CITY Norfolk

CIRCLE ONE

METER NO. 99824707 DATE READ 6/29/07 READING 312370 CU FT [✓ GAL]

METER NO. ______ DATE READ __/__/__ READING ______ CU FT GAL

METER NO. ______ DATE READ __/__/__ READING ______ CU FT GAL

METER NO. ______ DATE READ __/__/__ READING ______ CU FT GAL

METERS ARE TO BE READ DURING THE LAST 10 DAYS OF EVERY MONTH. READINGS MUST BE IN OUR OFFICE BY THE 10TH OF EACH MONTH.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 180.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy

Title: Environmental Compliance Coordinator

Signature: Amy E. Hardy

Date: 7/6/07

SPSA

Regional Office
723 Woodlake Drive, Chesapeake, VA 23320
phone: (757) 420-4700 fax: (757) 424-4133
www.spsa.com

Industry Name:	Southeastern Public Service Authority
Sample Point Address:	#1 Bob Foeller Drive, Suffolk, VA.
Location:	Regional Landfill (Permit # 0087)
Industrial Waste Code:	
Sample Point Code:	
Sampled By:	Charles E. Williams

GRAB SAMPLES

Parameter	Result	Unit	Det. Limit	Grab Date/Time	Analysis Date/Time	Method of Analysis	Analyst
pH	7.57	-----	<5.0	06-04-07 10:06	06-04-07 10:10	EPA 150.1	CEW
Total Phenols	0.33	mg/l	0.05	06-04-07 10:06	06-11-07 15:45	EPA 420.1	TER

The following results were provided by Air, Water, & Soil Laboratories:

COMPOSITE SAMPLES

Parameter	Result	Unit	Det. Limit	Date/Time Start	Date/Time End	Analysis Date/Time	Method of Analysis	Analyst
BOD	20.1	mg/l	2.0	06-04-07 10:03	06-04-07 14:16	06-05-07 16:05	SM5210B	RPF
Cu	<	mg/l	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH
Cr	0.014	mg/l	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH
Zn	0.035	mg/l	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH
Pb	<	mg/l	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH
Ni	0.043	mg/l	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH
Cd	<	mg/l	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH
Hg	<	mg/l	0.0002	06-04-07 10:03	06-04-07 14:16	06-11-07 11:44	EPA 245.1	CGT
As	0.035	mg/L	0.010	06-04-07 10:03	06-04-07 14:16	06-08-07 18:02	EPA 200.7	DMH

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Name: Amy E. Hardy
Title: Environmental Compliance Coordinator
Signature: Amy E. Hardy
Date: 7/9/07

AIR WATER & SOIL
LABORATORIES, INC.®
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Laboratory Order ID: 07060051

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond
Laboratory Sample I.D.: 07060051-001

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

GRAB SAMPLE

Parameter	Result	LOQ	Grab Date/Time	Analysis Date/Time	Analysis Method	Analyst
Phenols	0.33 mg/L	0.05	06/04/07 1006	06/11/07 1545	EPA420.1	TER

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature:
Name: Ted Soyars
Title: Laboratory Manager
Date Issued: 6/12/2007

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LABORATORIES, INC.®
2109A North Hamilton Street • Richmond, Virginia 23230 • Tel: (804) 358-8295 Fax: (804) 358-8297

Laboratory Order ID: 07060051

Industry Name: SPSA
Sample Pt. Address: Regional Landfill
Sample Pt. Location: Leachate Pond

Laboratory Sample I.D.: 07060051-002

Industrial Waste Code:
Sample Point Code:

Sampled By: Charles E. Williams

COMPOSITE SAMPLE

Parameter	Result	LOQ	Start Date/Time	End Date/Time	Analysis Date/Time	Analysis Method	Analyst
BOD	20.1 mg/L	2.0	06/04/07 1003	06/04/07 1416	06/05/07 1605	SM5210B	RPF
Cu	< 0.01 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
Cr	0.014 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
Zn	0.035 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
Pb	< 0.01 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
[illegible]	0.043 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
Cd	< 0.01 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
As	0.035 mg/L	0.010	06/04/07 1003	06/04/07 1416	06/08/07 1802	EPA200.7	DMH
Hg	< 0.0002 mg/L	0.0002	06/04/07 1003	06/04/07 1416	06/11/07 1144	EPA245.1	CGT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment, see 18 U.S.C. § 1001 and 33 U.S.C. § 1319. Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between six (6) months and five (5) years.

Signature: Ted Soyars
Name: Ted Soyars
Title: Laboratory Manager

Date Issued: 6/12/2007

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE 1 OF 1

CLIENT NAME: SPSA
CLIENT CONTACT: AMY HARDY
CLIENT ADDRESS: 1 BOB FOELLER DR. SUFFOLK VA
CLIENT PHONE NUMBER: 757-539-9373 x7
CLIENT FAX NUMBER: 757-539-1651
PROJECT NAME: HRSD MONTHLY LEACHATE
SITE NAME: REGIONAL LANDFILL
PROJECT NUMBER:
P.O. NUMBER: 4500024574
REGULATORY AUTHORITY:
Is sample for compliance reporting? [✓ YES] NO
Is sample from a chlorinated supply? YES [✓ NO]
PWS I.D. #:
SAMPLER NAME (PRINT): CHARLES WILLIAMS
SAMPLER SIGNATURE:
Turn Around Time: Day(s)
Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab or Composite Stop Date	Grab or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other	PHENOLS AMBER LITER H2SO4	BOD 1000 ml PLASTIC ICE	METALS (AS, CD, CR, CU, PB, HG, NI, ZN) HNO3 500 ml PLASTIC				ALL SAMPLES TRANSPORTED TO LAB ON ICE	COMMENTS Quote I.D.: PH CAL @0900 PH= 7.57@1010 FLOW ESTD 1002 FLOW SECURED 1415 COMPOSITE START 1003 COMPOSITE STOP 1414 PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1) LEACHATE POND			6-4-07	1004	1	✓				✓					1							PHENOLS = NEG
2) LEACHATE POND	6-4-07	1003	6-4-07	1414	2		✓			✓						1	1					@1012
3)																						
4)																						SAMPLES
5)																						POURED @1417
6)																						
7)																						
8)																						
9)																						ICE
10)																						2.1

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	6-4-07/1500	COURIER	
			6/5/07, 1100

QC Data Package
Level I ☐
Level II ☐
Level III ☐
Level IV ☐

LAB USE ONLY

COOLER TEMP _____ °C

SPSA-Hardy
Regional Landfill

07060051
DUE: 5 Days
Recd: 06/05/

329.xls

SPSA-Hardy **07060051**
Regional Landfill
DUE: 5 Days
Recd: 06/05/07

Sample Conditions Checklist

Opened by: (print) SW

Lab ID No.:

Date Cooler Opened:

(sign)

RECEIVED
JUN 05 2007

		YES	NO	N/A
1.	Were custody seals on outside of cooler?	☑	☐	☐
2.	Were custody seals unbroken and intact at the date and time of arrival?	☑	☐	☐
3.	Was the project identifiable from custody papers and were the custody papers filled out completely and correctly?	☑	☐	☐
4.	Did all bottle labels agree with custody papers?	☑	☐	☐
5.	Was cooler recieved on ice?	☑	☐	☐
6.	If yes, was their a temperature blank and was the temperature less than 4 degrees Celsius?	☑	☐	☐
7.	Was temperature check within acceptable limits?	☑	☐	☐
8.	Were all samples within holding time for requested tests?	☑	☐	☐
9.	Are all samples in propper bottles with appropriate preservative for the analysis requested?	☑	☐	☐
10.	Are all volatile organic bottles free of headspace?	☐	☐	☑

COMMENTS

HRSD Leachate Sampling
Field Worksheet

Facility: Suffolk Regional Landfill   Permit #: 0087

Address: 1 Bob Foeller Drive
Suffolk, Virginia 23434

Sampler: Charles E. Williams
Print   Signature

Field Log

Flow Established: 6/4/07 @ 1002 (Date / Time)   Flow Secured: 6/4/07 @ 1415 (Date / Time)

pH Meter: Beckman Model 255   Calibration: 6/4/07 @ 0900 (Date / Time)

Buffer Solutions: 4.00 4.00 (Result)   7.00 7.00 (Result)   10.02 10.00 (Result)

Slope: 98.9   Calibration Verification: 7.00/7.00 (Buffer / Result)

Grab Sample (pH, Phenols)

Sample ID: Leachate Pond   Sample Collection: 6/4/07 @ 1006 (Date / Time)

pH Result: 7.57   Time of Analysis: 1010

Phenols Interference Check: Negative (Positive or Negative)   1012 (Time Performed)

Composite Sample (BOD, As,Cd,Cr,Cu,Pb,Hg,Ni,Zn)

Composite Start: **6/4/07 @ 1003** (Date / Time)   Composite Stop: **6/4/07 @ 1416** (Date / Time)

Comments: Composite Poured @ 1417

SOUTHEASTERN PUBLIC SERVICE AUTHORITY
REGIONAL LANDFILL
HRSD Permit Number 0087

MONTHLY LEACHATE DISPOSAL QUANTITIES

Month JUNE Year 2007

Day	Pump Reading	Gallons Pumped	Day	Pump Reading	Gallons Pumped
1	3291423	0	17	4032628	0
2	3379804	88,381	18	4119456	86828
3	3379804	0	19	4119456	0
4	3447975	68171	20	4119456	0
5	3447975	0	21	4119456	0
6	3586844	138869	22	4235542	116086
7	3702229	115385	23	4235542	0
8	3757560	55331	24	4235542	0
9	3757560	0	25	4235542	0
10	3757560	0	26	4235542	0
11	3853409	95,849	27	4235542	0
12	3917905	69496	28	4235542	0
13	3917905	0	29	4313970	78,428
14	3917905	0	30	4365279	51,309
15	4011965	94060	31		
16	4032628	20663			

Monthly Total: 1078856 Gallons

Certification Statement

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information. I believe the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. See 18 U.S.C. §1319. (Penalties under these statues may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.

Name (print): Amy E. Hardy

Name (signature): Amy E. Hardy

Date: 7-2-07

Title: Environmental Compliance Coordinator

Word/nancy/forms/monthly leachate

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PERMIT MODULE IIIA – CELL VI Design and Construction
    Attachment IIIA-1 – Design Drawings
    Attachment IIIA-2 – Alternate Liner Variance

PERMIT MODULE IIIB – CELL V Design and Construction
    Attachment IIIB-1 – Design Drawings
    Attachment IIIB-2 – Alternate Liner Variance

PERMIT MODULE IIIC –Cells I-IV Design Drawings
    Attachment IIIC-1 – Design Drawings

Cells I through VI have been constructed prior to this amendment to incorporate the Cell VII Expansion. These documents and associated QA/QC construction reports are maintained in the facility operating record and incorporated here by reference only.

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MODULE X
Detection GW Monitoring

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PERMIT MODULE – X

DETECTION MONITORING
9 VAC 20-80-300.A and B.2

Detection monitoring is designed to ensure the earliest possible recognition of a leachate release from a regulated solid waste management unit (SWMU).

X.A. GROUNDWATER COMPLIANCE POINT

X.A.1 Uppermost Aquifer

The compliance point for groundwater monitoring is the uppermost aquifer on site [9 VAC 20-80-300.A.2.a]. The uppermost aquifer encompasses the entire thickness between the first encounter with groundwater (not to include any perched water) and the first encounter with a confining unit forming the lower boundary of the uppermost aquifer [9 VAC 20-80-300.A.3.f.(1).(b)].

X.A.2 Monitoring Well Locations

All wells in the monitoring network shall be installed within the permitted facility boundary [9 VAC 20-80-770.A], screened within the uppermost aquifer, and located at, or as close as practical to, the SWMU boundary [9 VAC 20-80300.A.3.a] unless a variance meeting the requirements of 9 VAC 20-80-770.B has been granted. No monitoring well serving the function defined under 9 VAC 20-80-300.A.3.a can be located more than 500 feet away from the SWMU boundary [9 VAC 20-80-770.A].

X.B. MONITORING NETWORK REQUIREMENTS

X.B.1 Performance Standards

X.B.1.a The Permittee shall install a groundwater monitoring network that meets the requirements of 9 VAC 20 -80- 300.A.2 and A.3.

X.B.1.b All wells utilized in the monitoring network shall at a minimum meet the requirements of 9 VAC 20-80-300.A.3.c and f.(1).

X.B.1.c Any wells that require abandonment shall be sealed and abandoned in accordance with existing EPA Resource Conservation and Recovery Act guidance as well as any applicable state or local requirements.

X.B.1.d If any wells require replacement due to non-performance, the Permittee shall:

X.B.1.e.(1) Within 30 days of recognizing the non-performance, notify the Department of the need to replace the non-performing well. Within that notification, provide for Department review [9 VAC 20-80-570.C.1], the proposed location for the new well shown on a site plan.

X.B.1.e.(2) Install the replacement well, prior to the next regularly scheduled groundwater sampling event unless the Director has granted an extension to meeting the monitoring system compliance requirements under 9 VAC 20-80-300.A.3.a.

X.B.2 Operations and Maintenance

The Permittee shall operate and maintain all wells in the monitoring network in a manner meeting the requirements of 9 VAC 20-80-300.A.3.e.

X.B.3 Well Designations

At a minimum, the monitoring network installed must meet the requirements of 9 VAC 20-80-300.A.3.f.(2). The following wells are included in the monitoring network:

Upgradient Well(s)	Downgradient Wells	
MW-10	MW-4R	MW-27
MW-16	MW-11	MW-28
MW-37^P	MW-12	MW-29
MW-10B	MW-15	MW-30
	MW-19	MW-31^P
	MW-21	MW-32^P
	MW-22R*	MW-33^P
	MW-24	MW-34^P
	MW-25	MW-35^P
	MW-26	MW-36^P

* - Wells MW-9 and MW-22R are located with in the permitted unit boundary of Cell VII. As such, the wells must be abandoned upon commencement of construction activities for Cell VII. MW-9 and MW-22R will be properly

abandoned in accordance with X.I.6 of this module.

P – Proposed well to be installed during Cell VII construction.

X.C AQUIFER INFORMATION

X.C.1 Aquifer Data Acquisition - Requirements and Response

X.C.1.a Static groundwater elevations shall be:

X.C.1.a.(1) measured in all monitoring wells in a manner that meets the requirements of 9 VAC 20-80-300.A.4.c.

X.C.1.a.(2) measured to an accuracy of 0.01 foot.

X.C.1.a.(3) obtained from all wells in the network within a single 24 hour period to avoid temporal variations/fluctuations in the groundwater table.

X.C.1.b Each time groundwater is sampled on site, the Permittee shall determine the groundwater flow rate and direction [9 VAC 20-80-300.A.4.c] in the uppermost aquifer using methods accepted for use in EPA RCRA programs.

X.C.1.c The Permittee shall evaluate the function of each of the wells included in the monitoring network using the static groundwater elevation data obtained each time groundwater is sampled. If the evaluation shows that one or more of the monitoring well(s) no longer functions in a manner that meets the requirements of 9 VAC 20-80-300.A.3.e, the Permittee shall:

X.C.1.c.(1) Within 30 days of recognizing the non-performance, notify the Department of the need to modify the number, location, or depth of the monitoring wells, and provide for Department review, proposed locations for new (replacement) monitoring wells keyed to a site plan.

X.C.1.c.(2) Complete additions or modifications to the network, prior to the next regularly scheduled groundwater sampling event, unless an extension has been granted by the Director for meeting the monitoring system compliance requirements under 9 VAC 20-80-300.A.3.a.

X.D. SAMPLING REQUIREMENTS

The Permittee shall meet the following:

X.D.1 Field sampling and laboratory procedures shall at a minimum meet the requirements of 9 VAC 20-80-300.A.4.a.

X.D.2 Sampling and analytical methods shall at a minimum meet those set forth in EPA SW-846 as amended [9 VAC 20-80-300.A.4.b].

X.D.3 Samples shall not be filtered prior to analysis.

X.D.4 The Permittee shall sample the groundwater for the Table 5.5 Detection monitoring constituents referenced under 9 VAC 20-80-300.B.2.a.

X.E SAMPLING FREQUENCY

X.E.1 Unless otherwise required when sampling to determine background, the Permittee shall, during the active life and post-closure care periods:

X.E.1.a sample and analyze all monitoring wells on at least a semi-annual basis [9 VAC 20-80- 300.B.2.a.(2)] unless the quarterly wetlands provisions apply [9 VAC 20-80-300.B.1.e].

X.E.2 The length of the semi-annual sampling period shall not exceed 180 days [9 VAC 20-80-300.B.2.a.(1)].

X.E.3 For facilities which continued to receive waste after June 30, 1999, the sampling requirements noted above may be superseded by the requirement to sample quarterly based on proximity to wetlands [9 VAC 20-80-300.B.1.e]

X.F DETERMINATION OF BACKGROUND

X.F.1 The Permittee shall establish site background values for all Detection monitoring constituents in manner consistent with the requirements of 9 VAC 20-80- 300.A.4.d - f and 300.B.2.a.(1).

X.F.2 Background concentrations shall be established within timelines that meet the requirements of 9 VAC 20-80- 300.B.2.a.(1).

X.G. STATISTICAL PROCEDURES

When evaluating the groundwater sampling event results, the Permittee shall:

X.G.1 use a statistical test meeting the requirements of 9 VAC 20-80-300.D.

X.G.2 within <u>30</u> days of completion of the laboratory analysis for each sampling event [9 VAC 20-80-300.A.4.h.(2)], determine whether or not there is a statistically significant increase over site background for each monitoring constituent using a method meeting the requirements of 9 VAC 20-80-300.A.4.h.(1) and 300.A.4.g.

X.G.3 for the purpose of this Permit, laboratory analysis is considered complete upon issuance of the analytical report under laboratory signature.

X.H ADDRESSING BACKGROUND EXCEEDANCES

When a Permittee has determined there has been a SSI exceedance over site background for one or more of the monitoring constituents, the Permittee shall:

X.H.1 notify the Director within the timeframes of 9 VAC 20-80-300.B.2.b.(1) which follow the end of the 30-day SSI determination period allowed by 9 VAC 20-80-300.A.4.h.(2)**.** The notification must indicate which groundwater monitoring constituents have shown statistically significant increases over background and describe whether the Permittee shall:

X.H.2 initiate Assessment monitoring described under 9 VAC 20-80-300.B.3 within the timeframes of 9 VAC 20-80-300.B.2.b.(2),

X.H.3 submit an Alternate Source Demonstration [9 VAC 20-80-300.B.2.c] meeting the content requirements and timeframe of 9 VAC 20-80-300.A.5**.** Unless Director approval of the demonstration is obtained, the Permittee shall follow the requirements and timeframes of 9 VAC 20-80-300.B.2.d **.**

X.I. RECORD-KEEPING REQUIREMENTS

The Permittee shall retain all records identified under 9 VAC 20-80-300.E.1 as well as 9 VAC 20-80-570.B.1 and B.2 throughout the active life (including closure) and post-closure care period.

The records shall be retained at the facility or another location approved by the Director.

X.J REPORTING REQUIREMENTS

X.J.1 *<u>Annual groundwater reports</u>* containing at a minimum the content described under 9 VAC 20-80-300.E.2.b, shall be submitted to the Director no later than March 1st of each calendar year.

X.I.2 *Semi-annual groundwater evaluations* containing at a minimum, the groundwater flow rate and direction determinations required under 9 VAC 20-80-300.A.4.c and the results of the inter-well statistical comparisons required under 9 VAC 20-80-300.B.2.b shall be submitted to the Department within 180 days of each semi-annual (or quarterly) sampling event.

X.I.3 While background is being established, the Permittee shall report to the Director, within 15 days of receipt of the data from the laboratory, the *laboratory analytical results* for each background sampling event. [9 VAC 20-80-300.E.2.a]

X.I.4. Within 30 days of establishing facility background, or re-establishing background due to the installation of new monitoring wells, or a change in sampling technique, the Permittee shall report the background values and statistical computations necessary to determine the values in a report entitled *Facility Background Determination Report*.

X.I.5 Within 44 days of well completion, the Permittee shall supply the Director a *Well Installation Report* containing the well number, surveyed elevation, boring log, casing length, total depth, and a completion diagram for each monitoring well, along with a certification from a qualified groundwater scientist that the monitoring wells have been installed in accordance with the submitted plans **[**9 VAC 20-80-300.A.3.d; 300.A.3.f.(3), and 9 VAC 20-80-300.E.1.c].

X.I.6 Within 44 days of well abandonment, the Permittee shall supply the Director a *Well Abandonment Report* containing information including field methods utilized, and a certification from a qualified groundwater scientist verifying the well abandonment activities met all applicable requirements [9 VAC 20-80-300.E.1.c].

X.J NOTIFICATION REQUIREMENTS

X.J.1 *Background SSI Notifications* shall be submitted to the Director within the timeframes noted under 9 VAC 20-80-300.A.4.h.(2) and B.2.b.(1).

X.J.2 *Well Non-Performance Notifications* shall be submitted to the Director within 30 days of recognizing the non-performance of one or more wells in order to meet 9 VAC 20-80-570.C.1 - 3.

X.K. MISCELLANEOUS ALLOWANCES

X.K.1 Alternate Site Background. The Permittee may request the Director allow site background to be developed using wells that are not hydrologically upgradient of the SWMU as long as the request addresses the technical criteria contained under 9 VAC 20-80-300.A.4.e, and is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, background shall be determined by sampling wells which are upgradient of the SWMU and meet the requirements of 9 VAC 20-80-300.A.3.f.(2).

X.K.2 Alternate Statistical Method. The Permittee may request the Director allow the use of an Alternate Statistical Method as long as the Permittee can demonstrate the alternate method can meet the technical criteria defined under 9 VAC 20-80-300.D.2. Until such time as Director approval is obtained, the statistical test(s) applied to site groundwater data shall be one from 9 VAC 20-80-300.D.1.a – d. Whichever method is approved for use at the site, the method should be listed in the facility *Groundwater Monitoring Plan* as required under 9 VAC 20-80-300.A.4.g.

X.K.3 Verification Sampling. The Permittee, at any time within the 30 day statistical determination period defined under 9 VAC 20-80-300.A.4.h.(2), may obtain verification samples if the initial review of analytical data suggests results which might not be an accurate reflection of groundwater quality. Undertaking verification sampling is a voluntary action and shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9 VAC 20-80-300.A.4.h.(2) or B.2.(b).

X.K.4 Data Validation. The owner or operator may at any time within the 30 day statistical determination period defined under 9 VAC 20-80-300.A.4.h.(2)**,** undertake third-party data validation of the analytical data received from the laboratory. Undertaking such validation efforts are a voluntary action and shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9 VAC 20-80-300.A.4.h.(2) or B.2.(b)**.**

X.L. MISCELLANEOUS DEMONSTRATIONS

X.L.1 To address an exceedance which is the result of something other than a release of solid waste constituents from the SWMU, the Permittee may submit a report entitled *Alternate Source Demonstration*, certified by a qualified groundwater scientist, for review by the Director within 90 days of providing the SSI notification unless the submission and approval timeframe has been extended by the Director for good cause [9 VAC 20-80-300.A.5].

X.L.1.a If a successful demonstration of an alternate source for the noted increase is made by the Permittee and approved by the Director within the 90 day timeframe, the Permittee may continue in the Detection monitoring program as defined in this Permit Module.

X.L.1.b If a successful demonstration of an alternate source for the noted increase is not made by the Permittee within the 90 day timeframe, the Permittee shall take actions required under 9 VAC 20-80-300.B.2.d under the Regulatory timeframes unless an extension has been granted by the Director.

X.L.2 The Permittee may submit to the Director, a *Multi-unit Groundwater Monitoring System Demonstration* containing the content defined under 9 VAC 20-80-300.A.3.b and certified by a qualified groundwater scientist, when he feels that the implementation of such a monitoring system will be as protective of human health and the environment as individual systems would be.

X.L.2.a If a successful demonstration is made and approved by the Director, the Permittee may discontinue use of individual monitoring systems and institute the monitoring of a multi-unit system.

X.L.2.b If a successful demonstration is not made, the Permittee shall initiate (or continue) to monitor individual networks under Detection monitoring.

X.L.3 The Permittee may request the Director suspend groundwater monitoring requirements by submitting a *No-Potential-Migration Demonstration,* certified by a qualified groundwater scientist, meeting the technical requirements of 9 VAC 20-80-300.A.1.c.

X.L.3.a If a successful demonstration is made and approved by the Director, the Permittee may suspend groundwater monitoring actions.

X.L.3.b If a successful demonstration is not made, the Permittee shall continue monitoring as required under 9 VAC 20-80-300.B.2.

X.M MODULE ATTACHMENTS

As required under 9 VAC 20-80-520.C, the Permittee must have an Operations Plan that includes detailed instructions concerning groundwater monitoring [9 VAC 20-80-520.C.2.a]. These detailed groundwater monitoring instructions must at a minimum cover the items listed under 9 VAC 20-80-300.A.4.a. The document containing these instructions, called the *Groundwater Monitoring Plan*, shall be attached as Attachment X-1 to this Module.

It shall be the responsibility of the Permittee to update this Plan as needed, which may include a Permit amendment action as defined under 9 VAC 20-80-620.A – F, if changes to the monitoring program have taken place since original Plan development

X.M LIMITATIONS

Solid waste shall not be deposited in or permitted to enter any surface waters or groundwater [9 VAC 20-80-250.C.10].

The groundwater monitoring and reporting requirements set forth here are minimum requirements. The Director may require, by amending the Permit, any owner or operator to install, operate, and maintain a groundwater monitoring system and program that contains requirements more stringent than those of the Regulations whenever it is determined that such requirements are necessary to prevent significant adverse effects on public health or the environment [9 VAC 20-80-300.A.2.c].

Should information contained in any Permittee authored attachment to this Module conflict with any requirement or condition contained herein, or language found within 9 VAC 20-80-10 et seq.**,** as amended; the Module condition and/or Regulatory requirement shall prevail over the language in the Permittee supplied attachment [see 9 VAC 20-80-60.D and 550.E] unless it can be demonstrated that a Variance from that regulatory requirement has been granted by the Director under 9 VAC 20-80-730 et seq.

When the Permittee recognizes a failure to submit any relevant facts or has submitted incorrect information in any groundwater monitoring report to the Director, he shall, within 7-days, promptly submitted such omitted facts or the correct information with a full explanation [9 VAC 20-80-570.E].

ATTACHMENT X-1

GW Monitoring Plan

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GROUNDWATER MONITORING
AND
SAMPLING & ANALYSIS PLAN

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Permit No. 417

Prepared for:

SPSA

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Prepared by:

HDR

HDR Engineering, Inc.

August 2008
Revised February 2009
Revised October 2009
Revised April 2010
Revised January 6, 2011
Revised January 20, 2011

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I. GROUNDWATER MONITORING PROGRAM

This Groundwater Monitoring Plan (GMP) documents procedures and instructions necessary to implement a facility groundwater-monitoring program for the Southeastern Public Service Authority (SPSA) Regional Sanitary Landfill (Permit No. 417) in Suffolk, Virginia. The Virginia Department of Environmental Quality (VDEQ) requires submittal of a groundwater-monitoring plan as part of the process for applying for a new permit or amending an existing permit. The previous groundwater-monitoring plan was prepared in 1996.

This GMP was prepared in compliance with Virginia Solid Waste Management Regulations (*VSWMR*) 9 VAC 20-80-300 B and Submission Instructions No. 12. The facility is currently implementing a Detection and Assessment Monitoring Program under 9 VAC 20-80-300 B 2 and 9 VAC 20-80-300 B 3, respectively.

A. Site Location Information

The Southeastern Public Service Authority (SPSA) Regional Sanitary Landfill is located on an 833-acre parcel at 1 Bob Foeller Drive in Suffolk, Virginia. The facility is owned and operated by SPSA of Chesapeake, Virginia. The geographic location of the facility is at latitude 36°45'19" and longitude 76°31'36". The facility is bound by State Routes 58, 13, and 460 to the south-southwest and by wooded areas to the north, east, and west. The location of the site is illustrated on a portion of the Suffolk, Virginia, USGS 7.5-minute topographic quadrangle map presented as Figure 1 in Appendix A.

The SPSA facility was permitted to begin operation as a sanitary landfill in September 1983. The facility began collecting waste in January 1985. A permit amendment dated March 4, 1994 added a 43.6-acre parcel to the pre-existing 103 lined acres, for a total of 146.6 acres of disposal area. The March 4, 1994 amendment also added an active methane gas recovery and power generation system to the existing landfill (cells I-IV). An additional lined disposal area, Cell V, was added under a permit amendment dated November 19, 1997 for the previously permitted parcel. Cell VI was added under a permit amendment dated November 7, 2005 for the previously permitted parcel. The total permit acreage to date is 187 (Cells I-VI). The Authority is currently in the process of adding an additional cell, Cell VII (56 acres), in the form of a Part B permit application.

The SPSA landfill includes four cells constructed above the upper most water-bearing unit (Columbia Aquifer) and two cells (Cell V & VI) excavated below the static water table. The construction of Cell VII will also involve excavating below the static water table. Cell V and VI consists of a double composite liner system, a leachate collection system and a groundwater dewatering system. The dewatering system for the collection of groundwater was installed separate from the leachate collection system. The dewatering system controls groundwater pressure on the bottom and sides of the Cell V and VI liner. Cell VII will also be constructed in a similar fashion.

A summary of expansion and operations involved in the construction and use of Cell V-VI and additional amendments to the facility can be seen in the landfill's Solid Waste Facility Permit No. 417. The summary of expansion and operations involved in the construction and use of Cell VII was submitted to VDEQ in the form of a Part B permit application.

The facility serves as a sanitary landfill for the cities of Chesapeake, Norfolk, Portsmouth, Virginia Beach, and Franklin and the counties of Isle of Wight and Southampton. SPSA facilitates disposal operations, composting operations, and burrow areas. Maintenance operations are conducted from the Operations and Maintenance facility located inside the entrance of the landfill. A ferrous recovery facility, tire shredding operation, landfill gas-to-energy plant, and composting facility also operate at the site.

B. Description of the Uppermost Aquifer

B.1. Topography

The SPSA facility is located on the western edge of a lowland sub-province with a mix of increasingly flat to broad upland slopes. The area has gentle drainage divides and mixture of layered marine and fluvial deposits. The average natural elevation is 20 feet above sea level.

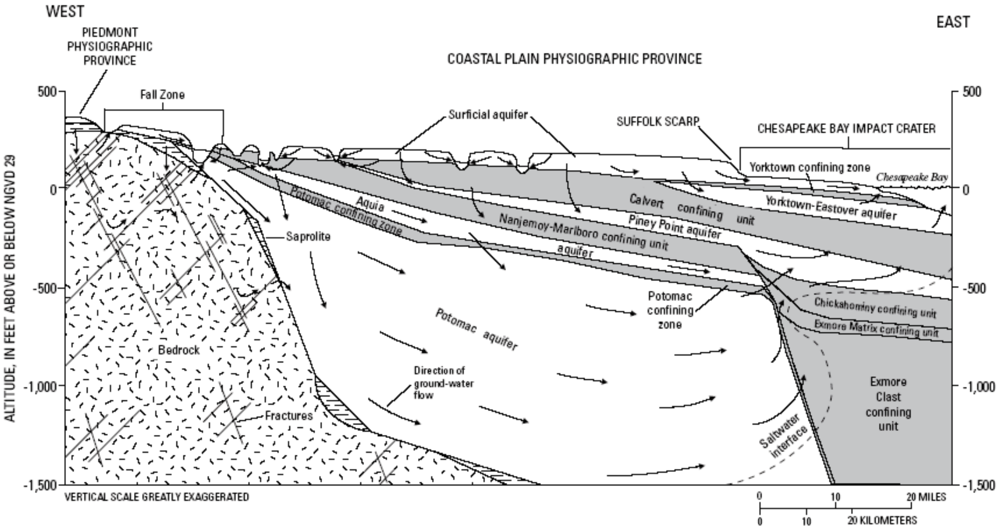
B.2. Soils

The soils in the region include a thin cover of surface upland derived detritus and/or an organic rich top horizon related to vegetation development and estuarine sediments. Lower horizons consist of sandy loams and silts related to coastal plain transgression and stream deposits.

B.3. Hydrogeology

The Coastal Plain of Virginia consists of a thick sequence of unconsolidated to partially consolidated sediments thickening seaward, ranging in geologic age from the Cretaceous to the Quaternary. These sediments were deposited as part of a seaward progradation of fluvial plains and deltas and a series of transgressions and regressions of the Atlantic Ocean due to changes in sea level. These sediments were further affected during the Tertiary Period by an asteroid impact near the mouth of the Chesapeake Bay. The Chesapeake Bay impact crater is greater than 50 miles in diameter and extends across a large part of the southeastern Virginia Coastal Plain.

Regional Geological Framework



Regional cross section from 2006, The Virginia Coastal Plain Hydrogeologic Framework: U.S. Geological Survey Professional Paper 1731.

The shallow surface materials of the Virginia Coastal Plain are composed of the Tabb formation. The Tabb formation includes sands, silts, and peat of coast-parallel plains seaward of the Suffolk and Harpersville scarps. It includes coeval terrace deposits along major river valleys west to the Fall Line. The Tabb formation is sub divided into three members: Poquoson Member, Lynnhaven Member, and Sedgefield Member. The Poquoson is a medium to coarse, pebbly sand that grades upward into clayey fine sand and silt, light- to medium-gray, and underlies ridge and swale topography along the margin of The Chesapeake Bay and in the lower and middle parts of Coastal Plain rivers. The member is 0 to 15 feet in thickness. The Lynnhaven Member is a pebbly and cobbly, fine to coarse gray sand that grades upward into clayey and silty fine sand and sandy silt. At the base of unit, locally, it is a medium to coarse cross-bedded sand and clayey silt containing abundant plant material fill channels cut into the underlying stratigraphic units. The units are surficial deposits of broad swales that are traceable southward from Norfolk. Extensive low lands bounded the unit on the landward side by river-, bay-, and ocean-facing scarps having toe altitudes of 15 to 18 feet. The member is 0 to 20 feet in thickness. The Sedgefield Member is a pebbly to bouldery, clayey sand and fine to medium, shelly sand that grades upward into sandy and clayey silt. In the channel fill at base of the unit, locally, includes as much as 50 feet of fine to coarse, cross-bedded sand and clayey silt and peat containing in-situ tree stumps. Sandy bay facies commonly contains Crassostrea biostromes, Mercenaria, Anadara, Polynices, Ensis, and other mollusks. Specimens of the coral Astrangia have yielded estimated uranium-series ages averaging 71,000 ± 7,000 yrs B.P. The unit constitutes surficial deposits to river and coast-parallel plains bounded on the landward side by the Suffolk and Harpersville scarps. Member thickness is 0 to 50 feet.

The shallow water table aquifer typically occurs within the Tabb Foramtion. From the hydrogeologic framework shown in the figure above, the formation is referred to as the Columbia aquifer.

Correlation to soil properties suggests that the horizontal conductivity of the sands within the upper Tabb formation is about $1x10^{-4}$ cm/sec. Considering the presence of fat clay layers, HDR anticipates that overall vertical conductivity is about $1x10^{-5}$ cm/sec.

Field test data on the horizontal conductivity of the lower portion of the Tabb formation suggests that the conductivity of the sands is about $1x10^{-3}$ cm/sec. Considering the presence of silt and clay layers, HDR anticipates that the vertical conductivity of the formation is about $1x10^{-5}$ cm/sec.

Underlying the Columbia "water table" aquifer is a thick sequence of Tertiary and Cretaceous age marine-deposited sediments that extend to a depth of over 2,000 feet. Within these marine sediments are confined aquifers and confining units. The Yorktown-Eastover aquifer is the aquifer that immediately underlies the water table aquifer beneath the site. The Yorktown aquifer is separated from the Columbia aquifer by the Yorktown confining unit. Beneath the site, the thickness of the confining unit is about 40 feet, based on regional Costal Plain data (USGS PP1731- HD-HD' Plate 5).

The geologist boring logs and geophysical logging information collected onsite indicates that the Yorktown confining unit is approximately 40 to 55 feet thick [refer to Part A Permits for Cells VI and VII submitted to the VDEQ Division of Solid Waste Management]. Both the Yorktown confining unit and the Yorktown aquifer are distinguished by their characteristically green-gray color and the presence of shells. The transition between the two units of the Yorktown formations is not sharp, but gradual. As such, there is a transitional zone between these two units.

B.4. Groundwater Flow Direction

Background data suggests that the groundwater flow within the Columbia Aquifer was originally toward the south. However, according to previous records and analysis, the groundwater flow of the Columbia aquifer has become south-southwest with the dewatering of Cell V and VI. The Yorktown Aquifer has a general groundwater flow toward the east (to the Atlantic Ocean). However, groundwater withdrawals and other local factors change flow trends.

Recharge occurs via infiltration of surface water through the Columbia Aquifer and from a hydraulic connection to the nearby Great Dismal Swamp. Installed nested groundwater wells (MW-10 and MW-10A) indicate established downward vertical gradients related to surficial recharge.

B.5. Groundwater Flow Rate Calculations

B.5.a. Groundwater Potentiometric Elevations

A groundwater potentiometric map based on the measurements recorded on March 13, 2008 is included as Figure 3 in Appendix A. Table 1 shows the static water level measurements and the calculated potentiometric elevations for March 13, 2008. Static water levels were measured from the top of the PVC casing and are collected prior to purging and sampling procedures. Historical groundwater elevations are included in Appendix B.

Table 1 - Groundwater Level Measurements

	Well	Depth to Water (ft)	Top of Casing Elevation (MSL)	Groundwater Elevation (MSL)
DEEP WELLS	DMW-101	11.86	20.58	8.72
	DMW-102	7.92	19.86	11.94
	DMW-104	7.32	24.02	16.70
	DMW-105	9.56	15.73	6.17
	DMW-106	25.93	23.67	-2.26
	MW-10A	7.14	23.41	16.27
SHALLOW WELLS	MW-10	3.57	23.41	19.84
	MW-10B	3.58	22.68	19.10
	MW-11	11.49	24.97	13.48
	MW-12	8.57	22.15	13.58
	MW-13	6.68	21.16	14.48
	MW-14	10.39	20.92	10.53
	MW-15	8.53	22.15	13.62
	MW-16	2.57	22.52	19.95
	MW-19	9.58	17.6	8.02
	MW-20	6.91	18.43	11.52
	MW-21	7.45	18.67	11.22
	MW-22R*	10.35	22.83	12.48
	MW-23	7.06	21.33	14.27
	MW-24	6.65	24.03	17.38
	MW-25	5.41	24.15	18.74
	MW-26	6.86	15.47	8.61
	MW-27	7.54	16.31	8.77
	MW-28	6.56	19.5	12.94
	MW-29	9.72	23.44	13.72
	MW-3	6.05	24.63	18.58
	MW-30	12.36	24.71	12.35
	MW-4R	9.98	25.75	15.77
	MW-5	6.50	22.94	16.44
	MW-6	7.82	22.93	15.11
	MW-9	10.40	23.28	12.88

Ft = feet; MSL = feet above Mean Sea Level; NA = Not Available

* MW-22R was damage after the February 2008 sampling event and could not be measured on March 13, 2008. On March 19, 2008 the damaged outer casing and top of the PVC riser casing was repaired. The new Top of PVC elevation is 22.83 feet MSL

B.5.b. Hydraulic Gradient

Hydraulic gradient (*i*) is the change in head (dH) per unit of distance (dL) in the direction of groundwater flow. Hydraulic gradient is the one factor for groundwater velocity calculations that changes with static groundwater measurements. Hydraulic gradients were calculated using the difference between static water levels measured in up-gradient well MW-16 and down-gradient wells. The average hydraulic gradient for 2008 is 0.005 feet per feet.

B.5.c. Hydraulic Conductivity

Hydraulic conductivity (*K*) is the measure of a specific geological unit's ability to transmit water. It is expressed as the volume of water that will move in a unit time under unit hydraulic gradient through a unit area measured at right angles to the direction of flow (USGS, 1989a). Values for hydraulic conductivity are necessary to calculate groundwater velocities. The Tabb Formation makes up the uppermost Columbia Aquifer. Based on regional Coastal Plain data from the USGS, the associated hydraulic conductivity for each geologic unit is as follows.

- Upper portion of the Tabb formation, 1 x 10^{-4} cm/sec horizontal and 1 x 10^{-5} cm/sec vertical.
- Lower Portion of the Tabb formation, 2 x 10^{-3} cm/sec horizontal and 1 x 10^{-5} cm/sec vertical.

Therefore, the estimated hydraulic conductivity for the Columbia aquifer is 2.98 ft/day.

B.5.d. Aquifer Porosity

Porosity (n_e) is the measure of a material's pore space (openings) through which water can flow. The Columbia Aquifer is unconfined and composed of silts and clays that may cause groundwater movement to be restricted via diversion or perching above less permeable layers of sediments. Based on the localized geology and rock type (Freeze & Cherry, 1979, pg. 37) and professional judgment, the effective porosity of the aquifer material is estimated to be 0.40. Values for porosity are necessary to calculate groundwater flow velocities

B.5.e. Groundwater Flow Velocity

Groundwater flow velocity (v_x) can be estimated using Darcy's equation of flow. Darcy's equation is expressed as:

$$v_x = \frac{Ki}{n_e}$$

where: v_x = linear flow rate (seepage velocity)
K = hydraulic conductivity
i = hydraulic gradient (dh/dl)
n_e = effective porosity of the aquifer

Groundwater flow velocities were calculated for groundwater flow between up-gradient monitoring well MW-16 and down-gradient monitoring well MW-17. The average groundwater flow velocity for 2008 is 0.23 ft/year.

The rate at which contaminants travel through the subsurface may be more or less than the groundwater flow velocity, due to natural physical, chemical, and biological factors (e.g., dispersion, soil adsorption, chemical degradation, oxidation, and anaerobic and aerobic biodegradation)

C. Groundwater Monitoring Plan Sheet

A plan sheet of the existing and proposed groundwater monitoring network for the facility is included in Appendix A. This plan shows all groundwater monitoring devices onsite in relation to the waste management unit boundaries, the phasing of cells, the facility boundary, and existing surface features.

D. Design of the Groundwater Monitoring System

D.1. General

Well placement and monitoring activities are determined by several physiographic factors including geologic conditions, homogeneous sediments, low hydraulic gradients, and lack of a groundwater divide. Subsequently, groundwater flow patterns are characterized to established up-gradient and down-gradient well placement. The placement and use of monitoring wells reflects the interpreted flow contours and changes from dewatering activities at the facility.

The current permitted groundwater-monitoring network, as described in the September 2005 Groundwater Monitoring Plan (GMP), was installed in accordance with 9 VAC 20-80-300 A.3 to monitor the upper-most Columbia aquifer. The proposed/amended groundwater-monitoring network includes four up-gradient/background monitoring wells:

- MW-10
- MW-10B
- MW-16
- MW-37

and twenty-three (23) permitted down-gradient/compliance-monitoring wells:

- MW-4R
- MW-11
- MW-12
- MW-15
- MW-19
- MW-20
- MW-21
- MW-22R*
- MW-24*
- MW-25*
- MW-26*
- MW-27*
- MW-28*
- MW-29
- MW-30
- MW-31*
- MW-32*
- MW-33*
- MW-34*
- MW-35*
- MW-36*

* - Non-subset wells per VDEQ approval letter dated March3, 2005.

D.2. Detection Monitoring Wells

The following proposed detection monitoring network will more effectively monitor the upper-most Columbia aquifer for inclusion of Cell VII as required by 9 VAC 20-80-300.A.3. The proposed detection monitoring network includes three up-gradient/background monitoring well:

- MW-37*

and twelve down-gradient/compliance monitoring wells:

- MW-22R*
- MW-24*
- MW-25*
- MW-26*
- MW-27*
- MW-28*
- MW-31*
- MW-32*
- MW-33*
- MW-34*
- MW-35*
- MW-36*

* - Non-subset wells per VDEQ approval letter dated March3, 2005.

A site map illustrating all well locations is included as Figure 3 in Appendix A. Geologic boring logs for the existing monitoring wells are included in Appendix C. All proposed wells will be installed and sampled in accordance with Part II Section G of this plan prior to the placement of waste in Cell VII.

Per the March 3, 2005 subset approval letter issued by the VDEQ, for all the non-subset wells identified above, if a verified statistically significant increase is observed during a monitoring event, the well will become an assessment monitoring well.

D.2.a. Well Deletion/Abandonment

Well MW-9 and MW-22R are located with the permitted unit boundary of Cell VII. As such, the wells must be abandoned upon commencement of construction activities for Cell VII. This wells will be supplemented by the installation of MW-31 through MW-37 in accordance with 9 VAC 20-80-300 A.3 to monitor the upper most Columbia Aquifer around Cell VII at a spacing of approximately 500 to 700 ft with in the facility boundary. MW-9 and MW-22R will be properly abandoned following the installation of the aforementioned monitoring wells.

D.3. Assessment Monitoring Wells

In accordance with 9 VAC 20-80-300 B 2 b and 9 VAC 20-80-300 B 3, several down-gradient/compliance wells that have historically exceeded inter-well statistical comparisons for one or more Table 5.1 priority pollutant metals have been designated assessment monitoring wells. Each well assessment monitoring well is listed below. The assessment monitoring network includes two up-gradient/background monitoring wells:

- MW-10
- MW-10B
- MW-16

and eight down-gradient/compliance monitoring wells:

- MW-4R
- MW-11
- MW-12
- MW-15
- MW-19
- MW-21
- MW-29
- MW-30

A site map illustrating all well locations is included as Figure 3 in Appendix A. Geologic boring logs are included in Appendix C. These existing wells will be sampled in accordance with Part II Section G of this.

D.4. Un-Permitted Monitoring Wells

In addition to the permitted wells listed above, several other un-permitted wells are utilized to help describe groundwater flow. Wells named with the prefix "DMW" were installed for the purpose of monitoring the semi-confined Yorktown aquifer. The un-permitted wells include:

- MW-3
- MW-5
- MW-5A
- MW-6
- MW-9
- MW-10A
- MW-13
- MW-14
- MW-20
- MW-23
- DMW-101
- DMW-102
- DMW-104
- DMW-105
- DMW-106
- DMW-107
- DMW-108

A site map illustrating all well locations is included as Figure 3 in Appendix A. Geologic boring logs are included in Appendix C.

D.4.a. Well Deletion/Abandonment

Well MW-9 and MW-22R are located with in the permitted unit boundary of Cell VII. As such, the wells must be abandoned upon commencement of construction activities for Cell VII. MW-9 and MW-22R will be properly abandoned following the installation of the aforementioned monitoring wells in Section I.D.2.a.

D.5. Down-gradient Wells

All down-gradient wells are located to detect releases from the waste management unit(s) in the shortest period of time.

D.5.a. Horizontal Placement

The overall groundwater flow direction of the facility is toward the southwest. All down-gradient monitoring wells are located on the down-gradient side of the waste unit(s). Horizontal spacing between the down-gradient wells is 500 feet. Spacing may be greater if there is interference from existing structures or utilities at the facility.

D.5.b. Vertical Placement

The vertical placement of the screened intervals for the monitoring wells is based on the thickness of the Columbia Aquifer, confining units, and the base grade elevations of the waste unit(s).

D.6. Up-gradient Wells

The up-gradient monitoring wells are located to the northern of the existing waste units. The lateral separation distance from the closest waste unit is 176 ft from MW-16, 215 ft from MW-10B, and 589 ft from MW-10. The up-gradient wells are screened in the same portion of the Columbia Aquifer as that monitored by the down-gradient wells.

D.7. Special Conditions

The majority of the waste units at the facility are an inward gradient design. Inward gradient means that the based grade elevation of the waste unit is below the natural static groundwater elevation. This requires the upper aquifer to be dewatered until sufficient ballast (waste) is placed within the lined waste unit to counteract the hydrostatic uplift pressures. This dewater is done via several groundwater dewatering sumps.

During dewatering operations, the created cone of depression alters the local groundwater flow direction toward the waste unit. The groundwater removed by the sumps is discharged to the surface. These surface discharges are monitored in accordance with the facilities Process Water Monitoring Plan.

D.8. Non Up-gradient Background Wells

There are no non-up-gradient background monitoring wells being proposed as part of this groundwater monitoring plan.

D.9. Monitoring Well Replacement

Any monitoring well that fails to perform as designed due to any of the reasons shown below shall be replaced prior to the next regularly scheduled groundwater sampling event to ensure the entire groundwater monitoring system continues to meet requirements of the VSWMR.

- Internal damage
- External damage
- Change in the elevation of the groundwater table
- Change as a result of phased development of waste cells or facility operations
- Failure to yield an adequate volume of groundwater for analysis

E. Geotechnical Investigation Techniques

E.1. Drilling Methods

Well borings are advanced into the subsurface using hollow-stem auger or air rotary methods. The following methods are acceptable standard practices:

- ASTM D5783-95(2006), Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geo-environmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.
- ASTM D5784-95(2006), Standard Guide for Use of Hollow-Stem Augers for Geo-environmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.

If alternate methods of installation are required, such methods will be discussed with the VDEQ prior to installation for approval.

E.2. Equipment Decontamination

Drilling equipment is always kept decontaminated between well installations by steam cleaning and sampling equipment is cleaned with non-phosphate soap and water.

E.3. Description of Drilling Fluids

No bentonite based or synthetic based drilling fluids will be utilized for the installation of the groundwater monitoring wells. Only water from the actual boring or other known clean sources of water may be used. Water obtained from municipal public water supplies are considered to be clean without additional analytical testing. Water provided by nearby groundwater wells or surface water bodies shall be analyzed for the parameters listed in Table 5.1 of the 9 VAC 20-80-300. All water used will have a backflow preventer installed on the discharge hose to prevent contamination of the supply. All storage tanks containers used for transportation or storage of the water will be new or properly decontaminated prior to use at the facility.

E.4. Soil and Rock Sampling Techniques

Soil sampling shall be performed in accordance with ASTM D 1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soil. For the majority of monitoring well installations, samples will be collected using a two-foot split-barrel sampler every five feet from the surface to proposed termination depth. Blow counts can be taken at 6-inch intervals to determine the Standard Penetration Test resistance, or N-value of the soil. These N-values can be used to evaluate the consistency of the soil.

Rock core sampling will not be performed as bedrock is located at a depth of 2,000 feet or more below existing ground elevation.

F. Monitoring Well Construction

Monitoring well construction and design incorporates techniques and materials in general accordance with the Solid Waste Permit and additional permit module amendments

F.1. Construction Materials

This section lists the well construction materials and identifies how the chosen materials will allow the wells to operate throughout the active life and post-closure care period of the facility without prohibiting the ability to obtain representative samples of groundwater.

F.1.a. Casing and Screen Type

Monitoring wells are constructed with 2-inch diameter flush-threaded Poly-Vinyl Chloride (PVC) screen and riser in the phreatic and vadose zones. The EPA Technical Enforcement Guidance Document (TEGD) for Groundwater Monitoring recommends an ASTM-approved PVC pipe as an appropriate well construction material where metals or volatile organics are the monitored parameters and/or anticipated potential groundwater contaminants. Well screens should be 10 to 20 feet in length and have a 0.01-inch factory-slot. Screen intervals will not be field slotted.

F.1.b. Filter Pack

The well filter pack fills the annulus between one and three feet above the top of each well screen. The filter pack types are selected for compatibility with the formation materials and screen slot size. A bentonite seal with a minimum thickness of two feet is placed immediately above the filter pack.

F.1.c. Grouting Procedure

The well annulus between the sealant and the concrete apron is filled with cement-bentonite slurry. The grouting slurry will be install utilizing tremie piping from the top of the installed bentonite sealing to within one foot of the surface.

F.1.d. Surface Completion and Protective Measures

Steel surface casings, concrete aprons, and locking caps are provided to secure and protect newly installed wells.

F.2. Well Survey Methods

The elevation of the top of the well casing (with locking cap removed) is established to an elevation ± 0.01 foot accuracy. The well locations will be measured with ±0.1-foot accuracy. All surveying is in relation to the existing landfill datum, which is established from a National Geodetic Vertical Datum. In addition, each well will be marked with a unique identification number.

G. Well Development

Upon completion of installation, each groundwater monitoring well is developed with maintenance access to the screen and sand pack in order to improve well yields and provide more representative samples from the aquifer. All wells are developed using bailing/pumping techniques. During development, measurements of pH, conductivity, temperature, turbidity, and color of the groundwater are recorded.

Rising and/or falling head slug tests should be performed upon any new well to establish aquifer properties. A sealed PVC slug is inserted into the well to cause the water level to rise or an airtight, pressurized seal is applied to the well casing using compressed nitrogen gas, causing the water level to decrease. A water level meter or pressure transducer/data logger measures the falling/rising head. After the water level has recovered to at least 90% of the original static water level, the slug is removed or the pressure is released, and the rebound of the water (rising head) is measured in the same manner as the falling head test. The Bouwer-Rice method is used to analyze the raw data and to calculate the hydraulic conductivity at the well. All items introduced into a well will be decontaminated before and after insertion, as specified in Section 5.8.

If the facility is currently implementing a Detection Monitoring Program, and upon completion of well development, a minimum of four independent sampling events will occur within 180 days of any new detection monitoring well installation. Initial samples are analyzed for the fifteen (15) inorganic parameters and forty-seven (47) organic parameters listed in Table 5.5 of the VMSWR 9 VAC 20-80-300 D. A list of Table 5.5 parameters is included in Appendix D.

H. Well Abandonment

Following the post-closure monitoring period, or whenever a monitoring well is damaged beyond repair, wells shall be abandoned in the following manner:

1. Well will be inspected to ensure that it is free of debris to its entire depth.
2. The filter pack, screen, and riser will be abandoned in place by filling the well with bentonite-cement slurry placed to within two feet of the proposed (i.e. re-graded) surface by tremie-tube methods.
3. If the well is being abandoned within the limits of a proposed waste unit or expansion, the filter pack, screen, and riser will be abandoned by over drilling the monitoring well with a boring diameter slightly greater than the original monitoring well boring. Once all materials are removed by over-drilling, the boring will be grouted with a bentonite-cement slurry to within two feet of the proposed (i.e. re-graded) surface by tremie-tube methods
4. The surface protective casing shall be removed and the site re-graded as necessary.

VDEQ will be notified in advance in writing of the intent to decommission any well or remaining piezometer. If necessary, permits will be obtained from the Regional VDEQ before any well is abandoned. All wells, which require abandonment, shall be plugged and abandoned in accordance with state regulations and the facility’s permit. All wells that are removed from the monitoring program will be certified abandoned within ninety days from removal of service.

I. Investigation Derived Waste

During the monitoring period for the facility, it may become necessary to perform subsurface investigations for a variety of purposes. This may include well installation in a contaminated zone, soil boring, test pits, or groundwater sampling. In the event that these investigation activities will occur in areas suspected or known to contain monitored constituent levels above background, then the handling of the spoil materials will be performed in accordance with VDEQ policy 01-1995”Policy for Handling of Investigation Deriver Waste” (revised 10/02/2003).

J. Documentation

In order to adequately document the installation of the new monitoring wells, the following information shall be documented.

- Date/time of construction
- Drilling method and drilling fluids
- Borehole and well casing diameter
- Casing materials
- Screen materials and design
- Casing and screen joint type
- Screen size/length
- Filter pack material, size, and grain analysis
- Filter pack volume calculations
- Filter pack placement method
- Sealant materials (percent bentonite)
- Sealant volume (lbs./gal of cement)
- Sealant placement

- Surface seal design and construction
- Well development procedure
- Type of protective well cap
- "As built" well diagram including dimensions
- Well location, specified to within 0.50 foot in horizontal plane
- Well depth, specified to within 0.01 foot
- Ground surface elevation, specified to within 0.01 foot
- Surveyor's pin elevation on concrete apron. Specified to within 0.01 foot
- Top of monitoring well casing elevation, specified to within 0.01 foot
- Top of protective steel casing elevation, specified to within 0.01 foot
- Drilling and lithologic logs

K. Certification

A transmittal letter, certified by a qualified groundwater scientist, shall be submitted to the Director acknowledging that all monitoring well(s) have been installed on site in accordance with submitted plans, if applicable, or with guidelines established in *Solid Waste Disposal Facility Criteria – Technical Manual, USEPA, 1993*. The certification letter shall be provided within 14 days of well completion.

II. GROUNDWATER SAMPLING AND ANALYSIS PLAN

Due to previous inter-well statistical exceedances of Table 5.5 parameters, the SPSA Regional Sanitary Landfill is no longer operating under the Detection Monitoring Program for selected monitoring wells. The facility initiated an Assessment Monitoring Program in February 2001. Field sampling of the detection and assessment monitoring wells and laboratory analysis of groundwater samples are currently being performed under the Detection and Assessment Monitoring Programs. The sampling frequency and required parameter lists associated with each monitoring program is summarized in Table 2.

Table 2 - Monitoring Programs Summary

Monitoring Program	Category	Monitoring Locations	Sampling Frequency	Parameter List
Detection	Background	MW-10, MW-10B, MW-16, and MW-37	Quarterly	Table 5.5
	Compliance	MW-22R, MW-24, MW-25, MW-26, MW-27, MW-28, , MW-31, MW-32, MW-33, MW-34, MW-35, and MW-36		
Assessment	Compliance	MW-4R, MW-11, MW-12, MW-15, MW-19, MW-21, MW-29, and MW-30	Quarterly	Table 5.5 plus Table 5.1 Detects
			Annual	Table 5.1

A. Sample Collection

The following section describes the sample collection procedures designed to ensure monitoring results are an accurate representation of groundwater quality.

A.1. Static Water Level Elevations

Groundwater elevations at each monitoring well shall be determined immediately prior to purging each time a sample is obtained. Static water level (SWL) measurements should be collected from the entire monitoring network within the same day and shall be measured to ± 0.01 foot. Well measurements will be made using an electronic water level probe, referenced to the top of the well casing. The static water level measurements of each groundwater monitoring well will be used to calculate the volume of stagnant water in the well and characterize changes in hydraulic conditions that may occur over time. A copy of the groundwater potentiometric level log is included in Appendix F.

The static water level measuring device used will be constructed of inert materials and decontaminated prior to each use, to prevent cross contamination from one well to another. The meter will be decontaminated with an alcohol wipe and rinsed with distilled and/or de-ionized water.

A.2. Well Evacuation

To properly evacuate stagnant water from the monitoring well, the wells will be purged with peristaltic pumps. The wells are purged at a low flow rate (no greater than 500 milliliters/minute) and thus are typically not required to have more than one well volume removed before sampling.

Well purging procedures begin upon arrival at the well. The time of arrival and atmospheric and well conditions are recorded. The water column is calculated using the difference between the Total Depth of Well (TDW) from the top of casing (TOC) and the SWL from TOC. Using the SWL, TDW, and well construction diagram, the water volume within the well can be computed.

Peristaltic pumps will be used to evacuate the wells. Clean, disposable nitrile gloves will be worn and appropriate measures will be taken to prevent surface soils and other contaminant sources from coming in contact with the purging equipment. During the evacuation period, pH, temperature, specific conductivity, and turbidity will be measured at regular intervals of 2 to 5 minutes. Purge water appearance and odor (if any) will be noted and recorded at each interval. Purging will continue until three (3) successive measurements of the indicator parameters meet the stabilization criteria shown on Table 3. If stabilization does not occur with one hour and one well volume has been purged sampling may occur.

Table 3 - Indicator Parameter Stabilization Criteria

Indicator Parameter	Stabilization Range
pH	+/- 0.1 s.u.
Specific Conductivity	3 %
Turbidity	$\leq$ 5 NTU or 10%
Temperature	10 %

The purge rate will be kept by using a graduated container to measure the rate and volume being removed. The time at which total purge volume is removed and the volume actually purged will be recorded in the field log. Using an electronic water level meter, the SWL will be measured during the purge in order to monitor the aquifer’s reaction to the purging procedures. Wells will be purged at a rate that will not cause recharge water to be excessively agitated. If the wells have extremely low yields, they will be evacuated to dryness once. Dry and low recharge rates will be noted in field observations.

Purge water from wells exhibiting constituent levels above GPS values in the previous sampling event will be collected and treated with a granular activated carbon filter, disposed of as leachate, or otherwise properly disposed. Purge water from other wells will be discharged to the ground surface.

Peristaltic pumps will be used for groundwater sample collection. Sampling will occur upon completion of the purging procedures as described in Section 5.5. All samples will be transferred directly from the sampling device into a container that has been specifically prepared for the preservation and storage of groundwater samples for specific analytical parameters.

In low yield formations where the well has been purged dry, samples will be collected when recovery is complete. Recovery is deemed complete when the well has recovered at least 80% of the draw down created by the purging, or when the well has recovered for at least two (2) hours since purging ceased. The well must be sampled within twenty-four hours of the completed purging time. If a monitoring well consistently will not supply adequate water for sampling, then the well will be considered for replacement or exclusion from the sampling program.

A.3. Number of Samples

For both the Detection and Assessment Monitoring Program, the number and quantity of samples will be collected as require by the specific testing method for each required constituent as indicated in US-EPA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846), Third Edition (as updated).

A.4. Sampling Equipment

Appropriate equipment must be selected from that available. It is necessary to ensure all equipment to be utilized meets the requirements of this GMP and analytical methods. Sample collection devices are carefully chosen to minimize the potential for altering the quality of the sample. Teflon and stainless steel are preferred materials, although PVC, HDPE, and other materials are considered sufficient for the analysis described herein.

A.5. Sampling Order

Monitoring wells will be sampled beginning with the up-gradient wells followed by down-gradient monitoring wells. Those down-gradient wells that may exhibit significant levels of contamination will be sampled last from least to greatest concentration based on the analytical results of the previous sampling event. Sample containers are to be filled in order of the parameter sensitivity to volatilization. The order of sample collection for analysis of parameters listed in Table 5.1 is shown on Table 4.

Table 4 - Preferred Order of Collection for Table 5.1 Parameters
Volatile Organics (VOC)
Semi-Volatile Organic Compounds (SVOC)
PCBs and Pesticides
Herbicides
Sulfide and Cyanide
Priority Pollutant (Total) Metals

A.6. Sampling Measurements

Temperature, pH, and specific conductance measurements should be made in the field before and after sample collection as a check on stability of the groundwater during the sample period. Turbidity at each well, measured in NTU's, should be noted during the groundwater sampling procedure.

A.7. Decontamination and Calibration Procedures

The facility will be using peristaltic pumps. Refer to Section II.A.2 and A.3 for equipment decontamination procedures for all non-dedicated down-well equipment.

Field instruments, such as pH, specific conductance, and turbidity meters are calibrated for accurate readings. Calibration of most field equipment should be performed daily. Calibrations will be conducted with approved standards and in accordance with the manufacturer-supplied manuals for each instrument.

B. Sample Preservation and Handling

A sample collection bottle kit will be prepared from the sample parameter list by the laboratory in accordance with approved sample analysis methods. A summary of the types of sample containers, sample handling, and preservation procedures for the parameters of interest is included in Appendix D. The sample kit will be stored in clean coolers for transport to the site.

C. Chain-of-Custody

The following chain-of-custody program will allow for the tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. The chain-of-custody program shall include the following elements.

C.1. Sample Labels

All sample containers will be new, laboratory cleaned, and certified bottles. The bottles will be properly labeled for identification and will include the following information.

- Sample identification number
- Name of sampler(s)
- Date and time of collection
- Place of collection
- Analysis parameter(s)/method (if space permits)
- Sample type – grab or composite
- Preservative
- Sample matrix
- Internal temperature of shipping container at time sample was placed
- Internal temperature of shipping container upon opening at laboratory
- Max and minimum temperature ranges that occurred during shipment

C.2. Sample Seals

When samples will leave the operator's immediate control, such as shipment to a laboratory by a common carrier, a seal shall be provided on the shipping container or individual sample bottles to ensure that the samples have not been disturbed during transportation.

C.3. Chain-of-Custody Record

Sample transport and handling will be strictly controlled to prevent sample contamination. Chain-of-Custody control for all samples will consist of the following:

- Sample containers will be securely placed in coolers (iced) and will remain in the continuous possession of the field technician until transfer of the samples to the laboratory for analysis has occurred.
- Upon delivery to the laboratory, samples will be given laboratory sample numbers and recorded into a logbook indicating client, well number, date and time of delivery. The laboratory director or his designee will sign the Chain-of-Custody control forms and formally receive the samples. The field technician and laboratory director will work together to ensure that proper refrigeration of the samples is maintained.

The Chain-of-Custody document will contain the following information (see Appendix F):

- Client name
- Client project name
- Client contact
- Client address
- Client phone/fax number
- Sampler(s) name and signature
- Signature of person involved in the chain of possession
- Inclusive dates of possession
- Sample identification
- Sample number

- Date & time of collection
- Matrix
- Type of container and preservative
- Number of containers
- Sample type - grab or composite
- Analysis parameter(s)/ method
- Internal temperature of shipping container when samples were placed in it
- Maximum and minimum temperature recorded during shipment
- Internal temperature of shipping container upon opening in the laboratory

D. Field Log Book

Field technicians maintain up-to-date field logs documenting important information pertaining to field activities. A blank copy of the daily field log and well sampling/micropurge log are included in Appendix F.

The field log sheets will document the following.

- Well identification number
- Well depth
- Static water level depth and measurement technique
- Presence of immiscible layers (yes – no)
- Estimated well yield
- Purge volume and purge pumping rate
- Exact time well purge began and ended
- Well evacuation procedure and equipment
- Field analysis data and methods
- Climatic conditions including air temperature
- Field observations on sampling event
- Well location, specified to within ± 0.5 foot in horizontal plane
- Name of collector
- Date and time of sample collection
- Sampling procedure
- Sampling equipment
- Types of sample containers used and sample identification numbers
- Preservative used
- Sample destination and transporter
- Internal temperature of field and shipping containers

The field notes will be reviewed quarterly to verify that the monitoring requirements of this GMP are met and to identify any unusual circumstances that may effect the implementation of the GMP.

E. Laboratory Analytical Procedures

The appropriate analytical methods for all required parameters are published in US-EPA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846), Third Edition (as updated). A summary of the required parameter categories and appropriate analytical methods is shown on Table 5. A list of specific Table 5.1 and 5.5 parameters and appropriate analytical methods is included in Appendix D.

Table 5 - Sampling Parameters and Analytical Methods

Table 5.1 and 5.5 Parameters	
Parameter Category	Analytical Method
Cyanide	SW-846 9010
Herbicides	SW-846 8151
Pesticides/PCBs	SW-846 8081/8082
Priority Pollutant Metals	SMW-846 6010B and 7000 Series
Semi-Volatile Organic Compounds	SW-846 8270
Sulfide	SW-846 9030
Volatile Organic Compounds	SW-846 8260
Volatile Organic Compounds (EDB, DBCP)	SW-846 8011

F. Quality Assurance and Quality Control

This section explicitly describes the QA/QC program to be used in the field and laboratory. If commercial laboratories are used, the operator must ensure that the laboratory of choice is exercising a QA/QC program that meets or exceeds that noted in the most current version of US-EPA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846) Third Edition (as updated).

F.1. Field QA/QC Program

The Field QA/QC Program describes the routine collection and analysis of trip and equipment blanks to verify that the sample collection and handling process has not affected the quality of the samples. Also, a description of the program for ensuring proper calibration of field equipment (prior to field use and re-calibrated in the field before measuring each sample) and equipment decontamination and chain-of-custody procedures is presented in the proceeding sections.

F.1.a. Atmospheric Contamination

In the event of rain and/or other adverse conditions, steps must be taken to protect the monitoring well, sampling bottles, and sampling equipment. In the event of a thunderstorm and/or harsh conditions, which may compromise field personnel safety and/or the sampling event, the field supervisor will decide whether to cease or continue sampling. This information will be relayed to the project manager immediately.

Atmospheric contamination must be avoided. Vehicle exhaust, particulate (i.e. dust and plant fallout), rain, or other contaminants must not be allowed to come into contact with the samples. When maneuvering to the monitoring well site by vehicle, every effort will be made to approach the well from downwind and to park the vehicle downwind of the well. The vehicle's engine will not be running in close proximity to the well. If necessary, clean plastic sheeting is to be placed around the monitoring well as well as on any working surface where sample containers or equipment may make contact.

In the event the field technician observes a situation that, in his/her judgment, could compromise the validity of the sampling or the health and safety of personnel, the field technician will immediately cease sampling and contact the field supervisor. Some instances are as follows.

- Inclement weather
- Dust or particulate from plants or equipment
- Mowing in close proximity of monitoring well
- Spraying of chemicals
- Dramatic changes in water quality (muddy or dry well)

The field supervisor will in turn contact the project manager who will make a decision to continue sampling or terminate the event. If the field supervisor terminates any sampling event, the re-sampling will be rescheduled and completed within 30 days of the original sampling event.

F.1.b. Decontamination Procedures

All equipment used for drilling, developing, sampling, and any other activity associated with on-site work will be decontaminated before it is taken from the site. All equipment coming in contact with media suspected of being contaminated will be decontaminated before it contacts a media which is likely to be less contaminated or uncontaminated.

Any non-dedicated purging equipment will be thoroughly decontaminated between wells by disassembling and will be cleaned in the following manner:

- Rinse with tap water.
- Wash with a non-phosphate laboratory detergent and tap water.

- Rinse with distilled water
- Allow to air dry.

All decontamination fluids will be managed and disposed of in accordance with VDEQ and Virginia Solid Waste Regulations. Disposable items will be disposed of as solid waste in an approved, permitted facility.

F.1.c. Purging and Sample Collection

All sampling equipment is to be clean and kept clean during all phases of purging and sample collection. The sample team will be divided into "clean hands" and "dirty hands" tasks. Only personnel with "clean hands" shall touch equipment that will come into contact with the sample. The other attendant, "dirty hands", shall perform calculations and manage paper work. Consideration will be given to special handling procedures, such as low-flow sampling (500 mL/minute or less).

F.1.d. Quality Control Sampling

Field quality control involves the routine collection and analysis of two types of QC blanks; trip and field blanks, to verify that the sample collection and handling processes have not impaired the quality of the samples.

- **Trip Blank** – Trip blanks are prepared for VOC and EDB/DBCP analysis. Laboratory personnel fill one of each type of sample bottle with deionized water and transport them to the site. Field personnel handle them like a sample and return them to the laboratory for analysis. Trip blanks are prepared immediately prior to the sampling event and transported with the empty bottle kits. A trip blank is used to indicate potential contamination due to migration of volatile organic compounds from the air on the site or in the sample shipping containers, through the septum or around the lid of the sampling vials and into the sample.
- **Field Blank** – The field blank is a sample of deionized water, which is taken to the field and used as rinse water for sampling equipment. The field blank is prepared like the actual samples and returned to the laboratory for identical analysis. A field blank is used to determine if certain field sampling or cleaning procedures result in cross-contamination of site samples or if atmospheric contamination has occurred.

Field and laboratory QA/QC also involves the routine collection and analysis of replicate field samples. These samples are collected at a rate of one per sample event. Replicates are two separate samples collected independently in such a manner that they equally represent the medium at a given time and location. Co-located samples provide intra-laboratory precision information for the entire measurement system, including sample collection, homogeneity, handling, shipping, storage, preparation, and analysis.

F.2. Laboratory QA/QC Program

Typically, all sample analyses should be completed within 30 days after receipt by the contract laboratory. Once completed and reviewed, the project manager should be alerted to any problems with the analysis results and the potential need for re-sampling. If possible, re-sampling will occur within 45 days of the original sampling event.

The laboratory's Quality Assurance/Quality Control (QA/QC) Manual will be used to ensure the integrity of the data for all aspects of the investigation. All analyses will be conducted in accordance with the methods presented in US-EPA Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846), Third Edition (updated).

All samples, including the trip and field blanks, will be assigned unique laboratory identification numbers. At the time of sample receipt they will be inspected for integrity and for consistency with information entered on the Chain-of-Custody document. They will also be tested for proper preservation or, in the case of volatile organic samples, inspected for lack of air bubbles in the sample vials. Deviations from any applicable protocol will be noted on the Chain-of-Custody document. Missing, broken, or improperly preserved samples will be replaced within 10 working days from the date that the deviation is first noted.

While awaiting analysis, samples will be stored in a secure location, under refrigeration (if refrigeration is a required method of preservation). If for any reason a method-prescribed holding time is exceeded, the sample will be discarded and replaced with a freshly collected sample.

F.2.a. Analytical Detection/Quantitation Limits (LOD/LOQ)

All analytical results will be reported relative to both a limit of detection (LOD) and a limit of quantitation (LOQ). LOD and LOQ values are parameter/method/matrix-specific. Sub-LOD results will be reported as not detected (ND). Results equal to the LOD value, or above the LOD value but below the LOQ value will be reported as estimated values. Results equal to or greater than the LOQ value will be reported without estimation.

If available, analytical methods will be selected to yield LOQ values that are equal to or below groundwater protection standards (GPS) for the required parameters. The GPS were established according to 9 VAC 20-80-300 B 3 h and i and VDEQ Guidance Documents.

To establish parameter-specific LOD and LOQ Values, the following procedures and/or conventions will be applied.

- If an LOD study has been performed, LOD values will be estimated using procedures set forth at 40 CFR 136, Appendix B.
- In the absence of an LOD study, LOD values published in SW-846 will be accepted as default values. In the event that an SW-846 method cites quantitation limits rather than detection limits (e.g. SW-846 Method 8270B), the LOD values will be assumed equal to 20% of the published quantitation limits.
- Whether the LOD values are experimentally derived, or adopted from SW-846, LOQ values will be as recommended in SW-846. If a particular method provides parameter-specific LOD values instead of LOQ values (e.g. SW-846 Method 8260A and most methods for metals), LOQ values will be obtained by multiplying the published LOD values by a factor of ten (10). (The use of published LOQ values from the outset will ensure consistency over the course of the monitoring program, thereby avoiding the introduction of artificial variability in non-detect data sets due to periodic changes in the actual LOD/LOQ values).
- It is conceivable that adjustments may need to be made from time to time due to circumstances beyond the direct control of project personnel. Such adjustments may derive from the need to dilute the sample to allow for quantitation within the linear portion of the calibration curve, or from the appearance of common laboratory contaminants in the laboratory method blanks, or from the occurrence of matrix interferences. Any such adjustments will be made only if absolutely necessary to comply with SW-846 requirements for data quality. All such adjustments will be explained and justified in a case narrative attached to the analytical report. Preliminary results (e.g. results for an undiluted sample) will be included with the case narrative.

F.2.b. Quality Assurance/Quality Control

Laboratory Quality Assurance/Quality Control (QA/QC) involves the routine collection and analysis of method reagent blanks, matrix spike and matrix spike duplicate samples, and laboratory control samples, to verify that the sample analysis procedures have not impaired the quality of the samples.

- Method Reagent Blank – The method reagent blank results from the treatment of deionized water with all of the reagents and manipulations to which site samples will be subjected. Positive results in the method reagent blank may indicate either contamination of the chemical reagents or the glassware and implements used to store or prepare the sample and resulting solutions.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) – A matrix spike is an aliquot of a field sample with a known concentration of target parameter added to it. A matrix spike duplicate is an intra-laboratory split sample spiked with a known concentration of target parameter. Spiking for each occurs prior to sample analysis. MS/MSD samples are collected for every batch of twenty or fewer samples. Matrix spike recoveries are used to indicate what effect the sample matrix may have on the reported concentration and/or the performance of the sample preparation and analysis.
- Laboratory Control Samples (LCS) – These samples generally consist of deionized water injected with the parameters of interest for single parameter methods and selected parameters for multi-parameter methods according to the appropriate analytical method. LCS samples are prepared and analyzed for each batch containing twenty or fewer samples. LCS recoveries are used to monitor analytical accuracy.

Surrogate recoveries are also measured as a part of laboratory QA/QC. Surrogates are organic compounds that are similar to the parameters of interest in chemical composition, extraction, and chromatography, but are not normally found in environmental samples. These compounds are spiked into all blank, standards, samples, and spiked samples prior to analysis for organic parameters only. Percent recoveries are calculated for each surrogate. Spike recoveries at or below acceptance criteria indicate whether analytical results can be considered biased high or biased low.

Field and laboratory QA/QC also involves the routine collection and analysis of replicate field samples. These samples are collected at a rate of one per sample event. Replicates are two separate samples collected independently in such a manner that they equally represent the medium at a given time and location. Co-located samples provide intra-laboratory precision information for the entire measurement system, including sample collection, homogeneity, handling, shipping, storage, preparation, and analysis.

G. Establishing Background Data

G.1. Background Data from Up-gradient Wells

The establishment of background data for the up-gradient monitoring wells shall be performed in a time frame adequate to account for change in the groundwater quality due to seasonal variation. A minimum of four consecutive sampling events shall be performed. Ideally, a sampling event from each annual quarter will be collected. However, an accelerated sampling period can be implemented if there does not exist sufficient time prior to waste placement within a newly constructed waste unit to be monitored. Samples collected on an accelerated schedule should be statistically independent and approved by the VDEQ prior to sampling.

G.2. Data from Wells that are not Hydraulically Up-gradient

The facility does not intend to utilized non-up-gradient monitoring wells for the establishment of background data. However, should the need arise, a determination based on 9 VAC 20-80-300.A.4.e will be performed in order to consider data from wells that are not located hydraulically up-gradient.

H. Techniques for the Evaluation of Groundwater Quality Data

H.1. Reporting Low or Zero Values

In order to filter analytical data that may not represent valid results, all data from the monitoring events are censored. Data flagged with a “J” qualifier indicates the quantitation of the parameter is less than the limit of quantitation (LOQ) but greater than the limit of detection (LOD). Data flagged with a “B” qualifier indicates the parameter was not detected significantly above the level reported in the laboratory blank. Parameters detected above the LOQ and not flagged with a “B” qualifier are subject to evaluation. Previous “non-detect” data used in order to calculate background intervals is adjusted according to industry standards.

H.2. Missing Data Values

If a sampling event results in a missing data value, an attempt to re-sample for the missing value shall be made within the compliance period of the initial sampling event. The re-sample shall be collected as close to the initial sampling event as possible to minimize the effects of variation due to the differences in sample collection time and to allow additional time for a verification sample if one is needed.

H.3. Outliers

An outlier test is performed to evaluate the presence of possible outliers in the data. The test uses a standard t-test to compare the largest value of a sample to the remaining values to evaluate whether an outlier is present. If an outlier is detected, the data is not necessarily discarded, but rather viewed as possibly causing a false-negative or false-positive result. Potential causes of outliers can include natural variation in groundwater quality, sampling method inconsistencies, laboratory analysis errors, and data transcription errors.

The test for outliers involves comparing the individual data points for each parameter within the same well against the remaining data from all other sampling events. If an individual data point deviates from the remainder of the data by a calculated amount, it is flagged as an outlier.

Observed background concentrations that are considered to be outliers will not be included in the statistical analysis. This is done in order to preserve the power of the test.

H.4. Statistical Tests

Inter-well statistical analysis will be conducted for down-gradient Table 5.1 and 5.5 inorganic parameters detected above the LOQ and not flagged with a "B" qualifier in the detection and assessment monitoring wells to determine if contamination is site-related. The inter-well statistical analysis process involves the following.

- Pooling up-gradient data
- Assessing data distribution
- Calculating upper prediction limits

H.4.a. Pooling the Up-gradient Data

To statistically compare the down-gradient data to the up-gradient/background data, the up-gradient data is combined, or "pooled." The combined up-gradient data is then renamed as a separate sampling location.

Up-gradient Pool: MW-10, MW-10B, MW-16, MW-37

The dates utilized for the background pools include enough sampling events to provide a sufficient number of data points to meet the minimum requirements for the selected statistical tests.

H.4.b. Assessing the Data Distribution

Most statistical tests assume that the data follow a normal distribution. The United States Environmental Protection Agency (EPA) guidance documents recommend the Shapiro-Wilk (<50 samples) or Shapiro-Francia (>50 samples) test to determine normality of the background data. It is based on the premise that if a set of data are normally distributed, the ordered values should be highly correlated with corresponding quantities taken from a normal distribution. The Shapiro-Wilk test is considered to be one of the very best tests of normality available for data sets of fifty values or less.

The Shapiro-Wilk test is performed to determine normality of the background data if less than 50% of the data is non-detects. The calculated Shapiro-Wilk test statistic (W) is compared to the critical values found in the literature and the assumption of normality is rejected if the test statistic (W) is lower than the critical value. The Shapiro-Wilk statistic (W) is determined by the following expression.

$$W = \frac{\left(\sum_{i=1}^{n} \alpha_{i,n} x_{(i)}\right)^2}{\sum_{i=1}^{n} (x_i - \overline{x})^2}$$

where: $\alpha_{i,n}$ = ith Shapiro-Wilk test coefficient (from tables)

$x_{(i)}$ = ith ranked data value (numerator)

x_i = ith ranked data value (denominator)

$\overline{x}$ = mean of the data set

For lager sample size (n >50), Shapiro Francia will replace the Shapiro Wilks test. For data that fails to show normal distribution, the data will be tested for log-normaility and natural log normality.

H.4.c. Calculating the Upper Prediction Limit

The distribution of background data may vary; therefore both parametric and non-parametric forms of the Prediction Limit method are used for statistical analysis. Prediction limits are constructed to contain the next sample value from a population or distribution with a specified probability. Evidence of contamination is indicated if one or more of the down-gradient sample values are greater than the upper prediction limit.

When the background data are normally distributed, the upper prediction limit (UPL) is determined by the following formula.

$$UPL = X + t_{(n-1,1-\alpha/k)} S \sqrt{(1 + (1/n)}$$

where:

X = mean of the background samples
t = Bonferroni *t*-statistic
n = number of background samples
$1-\alpha/k$ = probability of containing k future samples
S = standard deviation of the background samples
α/k = cannot be less than 0.01

When the background data is log-normally distributed, the upper prediction limit is calculated using log-transformed data in the above equation and then the result is transformed back to its original scale. A non-parametric upper prediction limit is used when the background data non-detected is <50% and is not normally distributed. A non-parametric upper prediction limit is used when non-detect is greater than 50 percent.

H.5. Groundwater Protection Standards

Based on VDEQ and EPA guidance (Code of Federal Regulations 40 CFR 258.55 (h) and (i)), Groundwater Protection Standards (GPS) were developed for the entire list of Table 5.1 parameters. A list of the GPS is provided in Appendix E.

In accordance with 9 VAC 20-80-300 B 3 h and i, the GPS were established by comparing the background concentration, Maximum Contaminant Level (MCL), and the Alternate Concentration Limit (ACL) for the parameter of concern. If an MCL exists for a given parameter, and the 95% Upper Prediction Limit (UPL) of the background data does not exceed the MCL, the GPS must be set to the MCL. If the 95% UPL of the background concentration for a given parameter is greater than the MCL, the 95% UPL of the background is chosen as the GPS. If the MCL does not exist (not promulgated), the use of VDEQ published ACL as the GPS is granted in the form of a variance petition in accordance with 9 VAC 20-80-760. The LOQ is used for those parameters with neither an MCL nor an ACL.

H.5.a. Groundwater Protection Standard Comparisons

As required by 9 VAC 20-80-300.B.3 (Assessment Monitoring for Sanitary Landfills), groundwater-sampling results from the assessment groundwater monitoring network are compared to the approved GPS as a value-to-value comparison. Table 5.1 parameters detected above the LOQ and not flagged with a “B” qualifier, are subjected to direct comparison to GPS. If GPS exceedance is noted during the value-to-value comparison for a parameter(s), the facility may collect a verification sample with in 30 days of the initial sampling event and results from the verification sampling event will be compared to the GPS. If the GPS is derived from an ACL or MCL, the facility may collect three additional independent groundwater samples within the same "compliance period" for the suspect constituents. The compliance period is defined as 180 days from the determination of the initial GPS exceedance. The results of the three additional samples will be use to perform a statistical comparison to the GPS using the lower confidence limit during the assessment monitoring (alpha level is not less than 0.05).

H.6. Verified Inter-Well and GPS Exceedances

The facility is currently implementing a Detection and Assessment Monitoring Program under 9 VAC 20-80-300 B 2 and VAC 20-80-300 B 3, respectively. In accordance with the Assessment Monitoring Program, the facility shall notify VDEQ in writing within fourteen (14) days of the receipt of laboratory analytical results of all verified GPS exceedances. In addition, the detection of a Table 5.1 parameter above the GPS in any assessment-monitoring well will trigger an Alternate Source Demonstration, a Nature and Extent of Contamination Study, and an Assessment for Corrective Measure (ACM) Report.

An Alternate Source Demonstration Report must be prepared in accordance with 9 VAC 20-80-300 A 5 and Submission Instructions No. 19, and submitted to VDEQ with 90 days of noting a GPS exceedance. In accordance with 9 VAC 20-80-300 B 3 g (1) (d), Nature and Extent Study activities and all other actions required by 9 VAC 20-80-310 A must begin within 90 days of noting a GPS exceedance. The ACM must be submitted within 180 days for the date the GPS exceedance was detected in accordance with 9 VAC 20-80-310 A 1.

In accordance with the Detection Monitoring Program, if inter-well statistical evaluations exhibit a verified statistically significant increase over background for one or more, Table 5.5 parameters at any detection-monitoring well the facility shall notify VDEQ in writing within 14 days of this determination.

In accordance with the Assessment Monitoring Program, if inter-well statistical evaluations exhibit a verified statistically significant increase over background for one or more, Table 5.1 parameters at any assessment-monitoring well the facility shall notify VDEQ in writing within 14 days of this determination.

Once the facility demonstrates that all Table 5.1 parameters have dropped below background levels for two consecutive Table 5.1 sampling events, the facility will transition from the Assessment Monitoring Program back to the Detection Monitoring Program.

H.7. Data Evaluation Considerations

H.7.a. Treatment of Replicate Samples

Field and laboratory QA/QC requires the collection of one field duplicate per monitoring event. For data evaluation purposes, replicates are averaged before statistical analysis is performed to form an independent data point. The total number of independent data points in a background pool plays an important role in the selection of a statistical method and the confidence level of the statistical method. In order to meet the required 95 percent confidence level, there must be a minimum of four independent data points within the background pool, although thirteen independent data points is preferable.

H.7.b. Treatment of Non-Detects in Background Data

The amount of data that are below the detection limits plays an important role in selecting the appropriate statistical evaluation method. The facility will use laboratory derived limits of detection and quantitation in the statistical analysis of groundwater data. For data where the percentage of data is below the laboratory limit of detection or laboratory limit of quantitation is less than 25 percent, the facility will replace the non-detects or non-qualified values with half the laboratory limit of detection or quantitation However, when the percentage of non-detects or non-quantified values is greater than 25 percent and less than 50 percent, the mean and standard deviation will be adjusted using either Aitcheson's adjustment or Cohen's adjustment. No test of normality is needed when the percentage of non-detects or non-quantified values is greater than 50 percent, since a non-parametric statistical test method will be applied.

H.7.c. Significance Levels

Another consideration involves the level of significance established for each set of statistical procedures. Each test offered by the Monitor System software provided several levels of significance from which to choose, ranging from 90 to 99 percent. The choice of a significance level requires the consideration of its effect upon the occurrence of a false-positive result (those where the test concludes something occurs when it actually does not) or a false-negative result (where something has occurred but the test does not recognize it). If, for example, a higher level of significance is selected to reduce the percent of false positives, then the percent of false negatives will increase.

H.7.d. False Positive Rates

Another consideration is the “experiment-wise false positive error rate.” Because statistical error rates accumulate with use, as more tests are conducted, an increased percentage of false conclusions will result. This is a commonly recognized problem for sites with numerous upgradient and down-gradient wells, and where a large number of parameters are analyzed. All statistical tests performed for this site were conducted using a significance level of 95 percent (i.e. - a false positive rate of 5 percent). For most statistical tests for groundwater, a significance level of 95 percent is acceptable to VDEQ.

H.8. Verification Sampling

The principal advantage of taking a verification sample is to maintain an acceptable site-wide false positive rate while the statistical test has adequate power to detect a release from the facility if it occurs. The verification sampling strategy involves collection of a pre-planned number of additional samples. The facility shall apply verification samples as follows:

The 1- of –m approach was initially suggested by Davis and McNichols (1987). The facility can take as many as m samples during the compliance period of the initial sampling event and if the 1- of- m (usually m=1 to 3) sample is below a prediction or tolerance limit, the constituent is said to have “passed” the test at that well. When the facility applies the verification sampling strategy, the alpha value should be modified as following:

a) Select a default value for α = 0.01

$$\alpha = 0.01$$

b) Pass the first or one of one verification resamples, adjust alpha

$$\alpha = (1 - .95^{\frac{1}{k}})^{\frac{1}{2}}$$

c) Pass the first or one of two verification resamples, adjust alpha

$$\alpha = (1 - .95^{\frac{1}{k}})^{\frac{1}{3}}$$

d) Pass the first or two of two verification resamples, adjust alpha

$$\alpha = \sqrt{1 - 0.95^{\frac{1}{k}}}\sqrt{\frac{1}{2}}$$

Where k is the number of comparisons and α is the site-wide false positive rate.

Please note that alpha can not be less than 0.01 unless the facility shows that the statistical comparison has at least as much statistical power as the EPA reference power curves (EPA 1992, Appendix B). Since the verification sampling is pre-planned, the facility can adjust the upper statistical limit calculated for background to account for the fact that the verification samples will be collected. Please note that the regulations do not allow a facility to disregard the statistical evaluation in a situation when the facility is unable to collect a verification sample. Therefore, if the facility would like to take a verification sample, it should be taken during the compliance period of the initial sampling event and the statistical result must include the verification sample prior to submitting it to the VADEQ. The verification sample must be independent from the initial sample.

H.9. Records and Reports

Refer to Section II.K – "Record Keeping and Reporting" for the description of data types that will be kept, the format in which they will be recorded, and the format and submission timelines of any required reports dealing with the results of groundwater sampling.

I. Statistical Analysis of Subsequent Well Data

I.1. Comparison with Subsequent Well Data

The operator will perform the statistical evaluation and analysis as outlined in Section II.H of this plan in order to determine whether or not a statistically significant increase over background values for each constituent has occurred at the close of each sampling event.

I.2. Required Response Actions

For any validated statistically significant increase noted in one or more groundwater monitoring constituents during the statistical evaluation, the owner will comply with the reporting time frames establish in 9 VAC 20-80-300.B.2 & B.3 for both Detection and Assessment Monitoring.

J. Groundwater Elevation Data Interpretation

The static groundwater surface elevations obtained prior to sampling shall be used to create potentiometric maps to verify whether the detection and assessment monitoring networks continue to satisfy requirements for monitoring the upper-most aquifer. If the static groundwater surface elevations exhibit abnormal elevations, a round of groundwater measurements will be collected for verification purposes. If the potentiometric maps, using verified groundwater surface elevations, reveal that the depths, locations, or number of wells is insufficient to monitor solid waste constituents migrating from the solid waste management area, new well locations and depths will be submitted to VDEQ for their approval, and subsequent installation and monitoring will be performed. Quarterly evaluations of static groundwater surface elevations will be conducted to decide if monitoring well locations are adequate.

J.1. Seasonal Variation

The groundwater monitoring data for the facility was reviewed for the fluctuation of groundwater levels from October 6, 2004 to April 29, 2009. Historical groundwater levels were found to fluctuate from a maximum of 9.32 feet to a minimum of 1.76 feet. The fluctuation of the groundwater level can directly influence the increase or decrease of constituent concentrations as soil media becomes either saturated or unsaturated. In an unsaturated condition, constituents are able to oxidize, thus increasing the concentrations in the soil that can become mobilized in a saturated condition upon associated geochemical changes. Monitoring wells down-gradient or within the host soil media will have increasing levels of detection with groundwater level rise and decreased levels of detection with falling groundwater levels.

K. Record Keeping and Reporting

K.1. Monitoring Well Installation Report

In accordance with 9 VAC 20-80-300 A 3 f (3), all new permitted monitoring wells must be certified by a qualified groundwater scientist noting that the well(s) have been installed in accordance with all applicable regulations, within 30 days of well installation. Within 14 days of this certification, the facility shall submit the certification to VDEQ in the form of a Monitoring Well Installation Report.

This report will include a description of the groundwater monitoring system including the number of monitoring wells and location of up-gradient/background and down-gradient/compliance monitoring wells. The report will also include details on drilling methods, construction materials, well intake design, well development, and associated documentation for well installation. If possible, the results of aquifer (slug) tests for the new wells will be included.

K.2. Detection Monitoring Reporting

If during a detection monitoring event, the owner or operator determines that there is a statistically significant increase over background as determined by a method, discussed in Part II.H of this plan, for one or more of the constituents listed in Table 5.5 at any detection monitoring well at the waste management unit boundary, the owner or operator shall:

- Within 14 days of this finding, notify the VDEQ by indicating which constituents have shown statistically significant changes from background levels;
- Within 90 days, establish an assessment monitoring program meeting the requirements of 9 VAC 20-80-300 B 3 except as provided for in 9 VAC 20-80-300 B 2 c of the VSWMRs.
- The owner or operator may submit an Alternate Source Demonstration as specified in 9VAC20-80-300 A 5. If, after 90 days, a successful demonstration is not made, the owner or operator shall initiate an assessment monitoring program as required in 9 VAC 20-80-300 B 3. The 90-day period may be extended by the director for good cause.

K.3. Assessment Monitoring Reporting

After obtaining the results from the initial or subsequent assessment sampling events required in 9 VAC 20-80-300 B 3 b, the owner or operator shall:

- Within 14 days, notify the director identifying the Table 5.1 constituents that have been detected and place a copy in the facility's operating record;
- Within 90 days, and on at least a semi-annual basis thereafter, resample all wells, conduct analyses for all constituents in Table 5.5, and for those constituents in Table 5.1 that are detected in response to 9 VAC 20-80-300 B 3 b, and record their concentrations in the facility operating record. At least one sample from each well (background and down-gradient) shall be collected and analyzed during these sampling events;
- Within 180 days, establish background concentrations for any constituents detected pursuant to 9 VAC 20-80-300 B 3 b. A minimum of four independent samples from each well (background and down-gradient) shall be collected and analyzed to establish background for the detected constituents; and
- Within 180 days, submit proposed ground water protection standards for all constituents detected pursuant to 9 VAC 20-80-300 B 3 b. The ground water protection standards shall be approved by the director in accordance with 9 VAC 20-80-300 B 3 h or i and placed in the facility's operating record.

K.4. Quarterly Groundwater Reports

As part of the Detection and Assessment Monitoring Programs, a report will be submitted on a quarterly basis to document the results of the groundwater-monitoring event. Quarterly groundwater monitoring reports should be submitted to VDEQ within 180 days of the completion of the corresponding groundwater-sampling event.

Analytical results will be reported in the form of a laboratory report that will contain the following information.

- Facility name and location
- Date issued
- Sample identity and description
- Date and time of sample collection
- Data and time of sample analysis
- Analytical method citations
- Analytical results, relative to the appropriate LOD and LOQ values
- Signature of authorized laboratory representative
- Copy of Chain of Custody documents

If requested, an expanded analytical QA/QC package can be prepared for each batch of samples. Because of the additional costs associated with the expanded package, it is not deemed necessary for all rounds of samples. The laboratory collects all of the necessary information for the formation of the expanded package, but does not prepare one unless requested. The expanded QA/QC package will include the following elements.

- Case narrative documenting chronology of events, holding times, and methods of analysis; also addressing any deviations and their effect, if any, on data quality
- Instrument-generated tuning results for GC/MS instrument systems
- Method reagent blank report
- Laboratory control sample report
- Surrogate recovery report
- Matrix spike recovery report
- Instrument-generated chromatograms
- Relative percent deviation report for duplicate samples
- Laboratory bench sheets

Each quarterly report will also contain the statistical analysis of laboratory results. Statistical analysis of groundwater monitoring data may include the following.

- Identification of suspected outliers
- Identification of statistically significant increases for detected down-gradient parameter concentrations when compared to upgradient/background monitoring data

- Identification of statistically significant exceedances in detected parameter concentrations when compared to Groundwater Protection Standards (GPS)
- Trend analysis

Each report will also include a brief site description, groundwater monitoring history, and groundwater elevation evaluation, including a groundwater potentiometric map

K.5. Annual Groundwater Reports

As required by 9 VAC 20-80-300 E (Record Keeping and Reporting), Annual Groundwater Monitoring Reports will be prepared in accordance with Submission Instructions No. 14 and 9 VAC 20-80-300 E 2 b. The Annual Groundwater Monitoring Report will be submitted to VDEQ not later than March 1st of each calendar year and shall be accompanied by a signature page and a completed form ARSC-01.

The Annual report will contain at a minimum the following technical items.

- Landfill name, location (keyed to a USGS topographic map), and permit number
- Summary of site history
- Physical setting description
- Description of uppermost aquifer and well network
- History of groundwater monitoring activities on site
- Review of past variances or other department approvals
- Statement noting that the monitoring well network meets the requirements of 9 VAC 20-80-300 A 3
- Listing of the groundwater sampling events undertaken during the previous calendar year
- Evaluations of and appropriate responses to groundwater elevation data, groundwater flow rate, groundwater flow direction, and groundwater analytical data

III. REFERENCES

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APPENDIX A

FIGURE 1 - USGS TOPOGRAPHIC MAP

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FIGURE 2– USGS GEOLOGICAL MAP

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FIGURE 3 – POTENTIOMETRIC MAP & WELL LOCATION MAP

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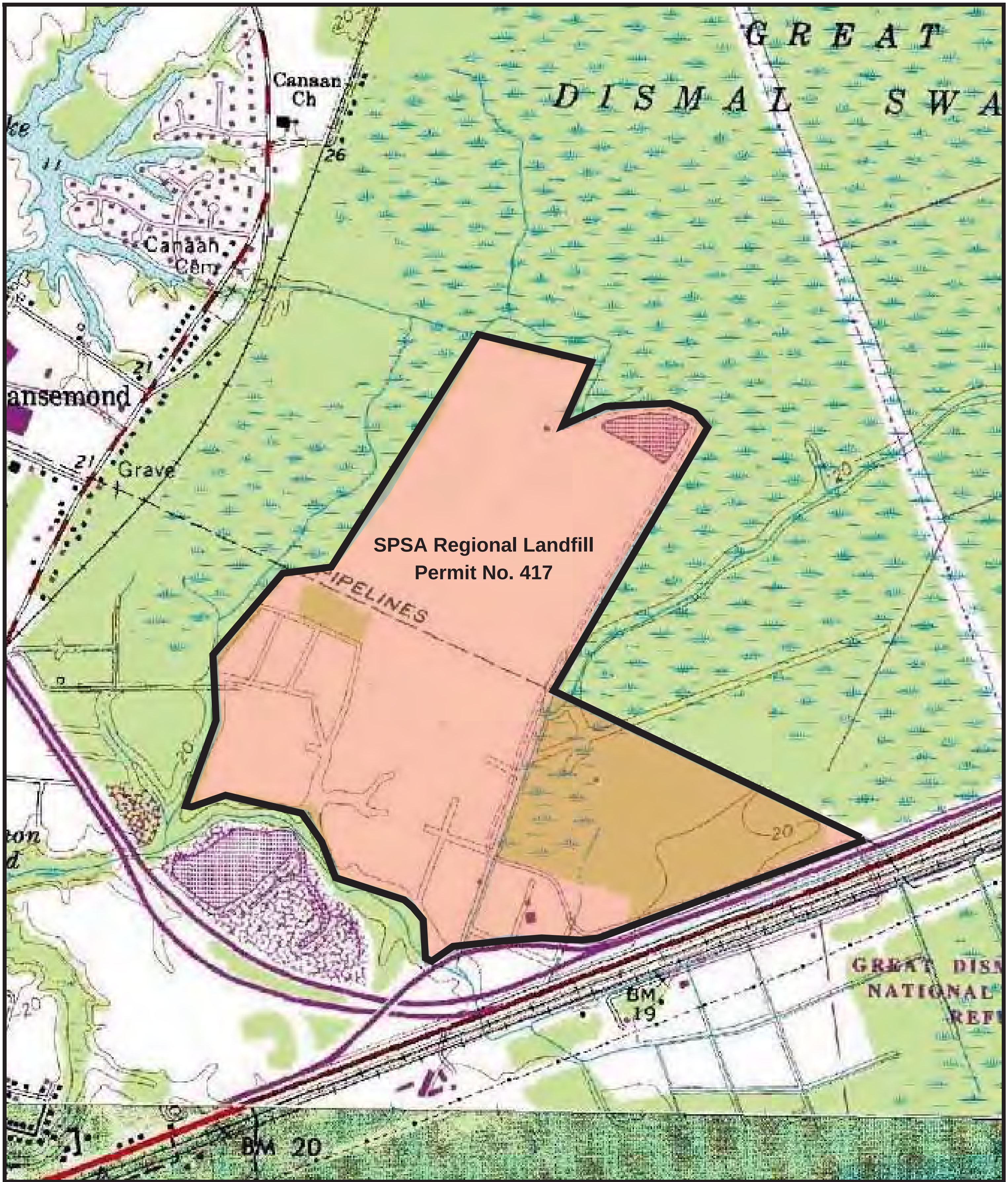
FIGURE 4 – POTENTIOMETRIC SURFACE MAP

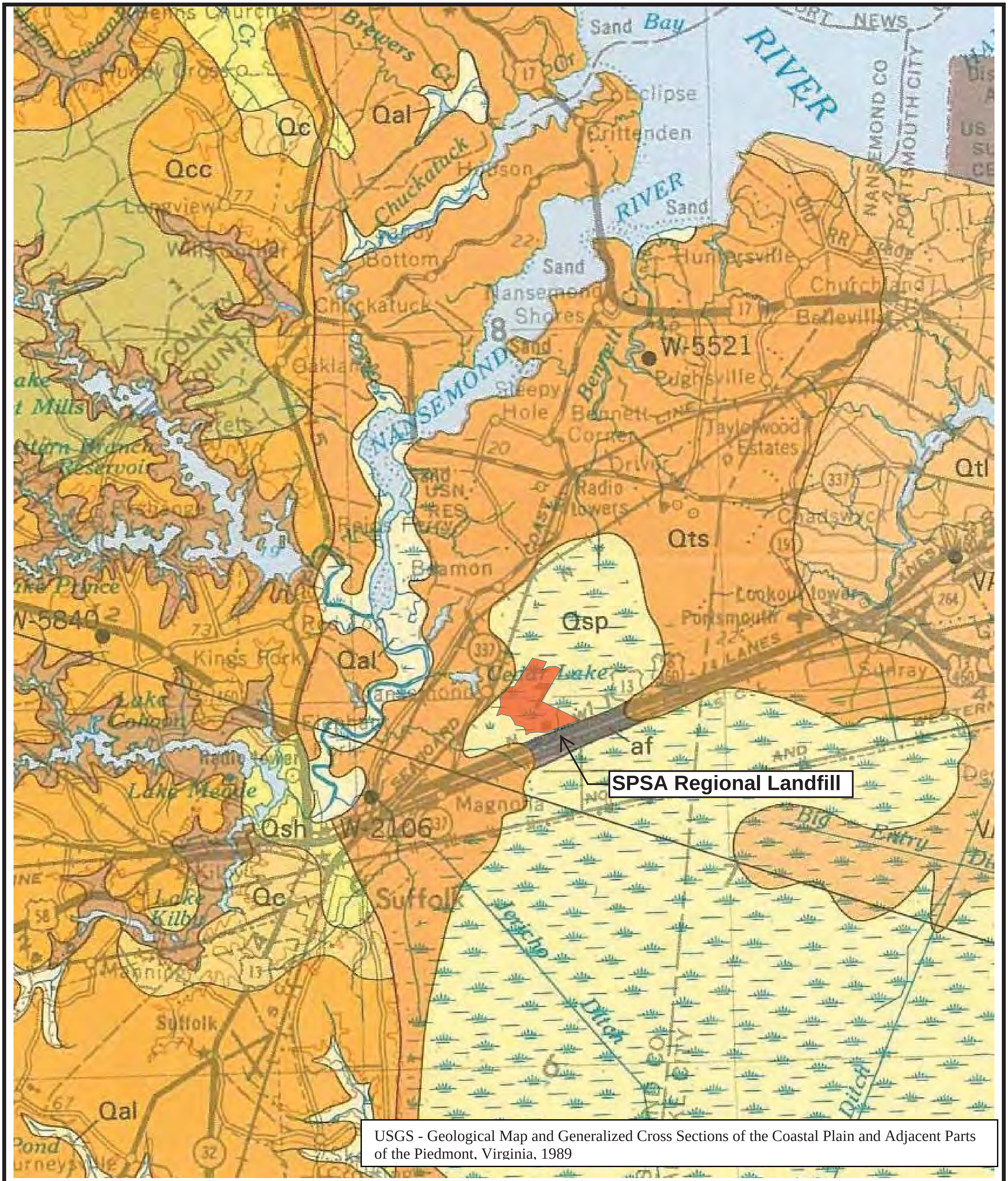


Scale: 1 inch = 1,200feet

Figure 1 – USGS 7.5' Quadrangle of Suffolk, VA

SPSA Regional Landfill

Permit No. 417 - City of Suffolk, Virginia



USGS - Geological Map and Generalized Cross Sections of the Coastal Plain and Adjacent Parts of the Piedmont, Virginia, 1989

HDR

Figure 2 – Geologic Map

SPSA Regional Landfill

Permit No. 417 - City of Suffolk, Virginia

Scale: Not to Scale

SCALE IN FEET

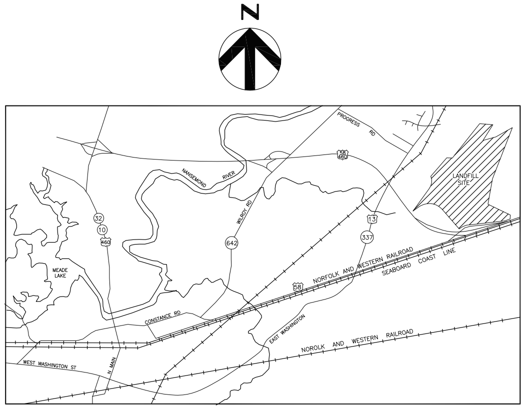
300 150 0 300 600

LEGEND

– – –	GROUND WATER CONTOURS (MAJOR)
- - - -	GROUND WATER CONTOURS (MINOR)
—— 120 ——	EXISTING GRADE CONTOURS (MAJOR)
– – –	SITE ACCESS ROAD
— —	LANDFILL WASTE LIMITS
SUMP-1	GROUND WATER SUMP
MW-22R	GROUND WATER MONITORING WELL (SHALLOW)
DMW-102	GROUND WATER MONITORING WELL (DEEP)
▼P-1	PIEZOMETERS
MW-34	PROPOSED MONITORING WELL
←	GROUND WATER FLOW DIRECTION

NOTE:

1. POTENTIOMETRIC SURFACE IS BASED ON GROUNDWATER LEVELS OBSERVED ON MARCH 13 AND 14, 2008.



LOCATION MAP

HDR

HDR Engineering, Inc.
of the Carolinas

128 S Tryon Street, Suite 1400 | Charlotte, NC 28202

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	AARON WHITE, P.G.
GEOLOGIST	AARON WHITE, P.G.
Q.C.	
CADD	G.M.WILLIAMS, E.I.
PROJECT NUMBER	000000000066745

SPSA REGIONAL LANDFILL

SUFFOLK VIRGINIA

WELL LOCATION MAP

0 0.5" 1"

FILENAME	01C-03.dwg
SCALE	1"=300'

SHEET
C-03

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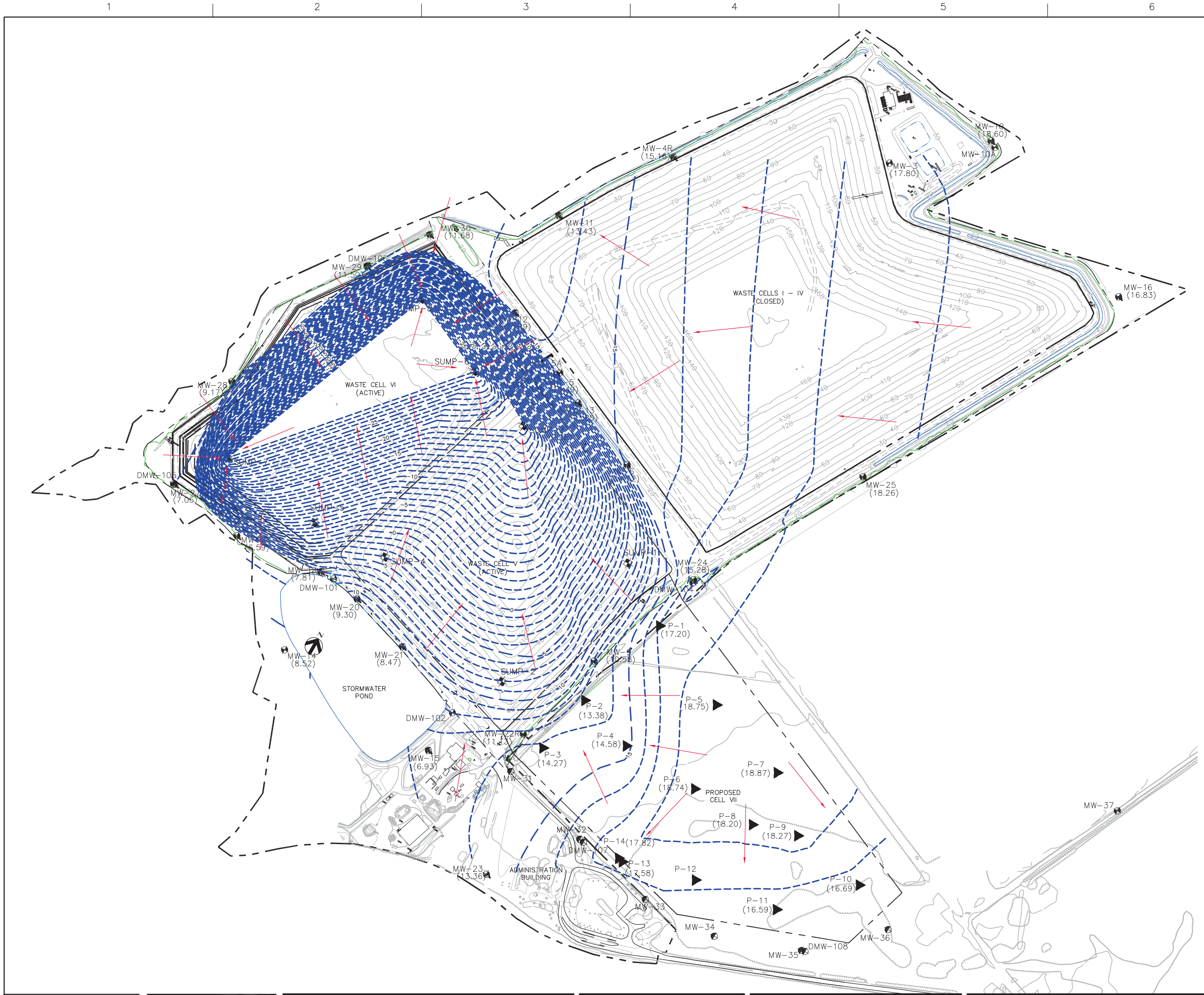


N

SCALE IN FEET

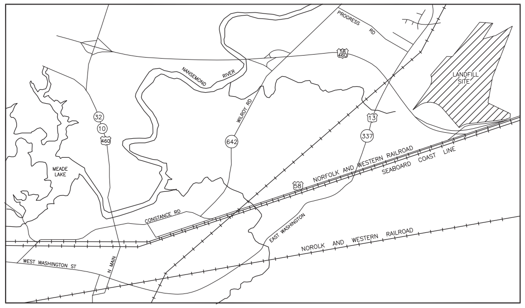
300 150 0 300 600

LEGEND

▬ ▬ ▬	GROUND WATER CONTOURS (MAJOR)
▬ ▬ ▬	GROUND WATER CONTOURS (MINOR)
—— 120 ——	EXISTING GRADE CONTOURS (MAJOR)
— — —	SITE ACCESS ROAD
— - —	LANDFILL WASTE LIMITS
SUMP-1	GROUND WATER SUMP
MW-22R	GROUND WATER MONITORING WELL (SHALLOW)
DMW-102	GROUND WATER MONITORING WELL (DEEP)
▼P-1	PIEZOMETERS
MW-34	PROPOSED MONITORING WELL
←	GROUND WATER FLOW DIRECTION

NOTE:

1. POTENTIOMETRIC SURFACE IS BASED ON GROUNDWATER LEVELS OBSERVED ON MARCH 13 AND 14, 2008.



LOCATION MAP

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Q.C.	
CADD	G.M.WILLIAMS, E.I.
PROJECT NUMBER	000000000066745

SPSA REGIONAL LANDFILL

SUFFOLK VIRGINIA

POTENTIOMETRIC SURFACE MAP

0 0.5" 1"

FILENAME	01C-04.dwg
SCALE	1"=300'

SHEET C-04

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APPENDIX B

HISTORICAL GROUNDWATER ELEVATIONS

REGIONAL LANDFILL HISTORICAL GROUNDWATER ELEVATIONS (ft, AMSL)

WELL ID	MW-3	MW-5	MW-6	MW-9	MW-10	MW-10A	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-19	MW-20	MW-21	MW-22R	MW-23	MW-24	MW-25	MW-26	MW-27	MW-28	MW-29	MW-30
Monitoring Event																								
Apr-1999	18.21	15.71	11.37	▨	16.51	20.17	14.86	13.91	15.25	10.38	13.12	20.84	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Aug-1999	18.6	16.64	14.73	▨	13.96	17.69	14.37	14.73	16.34	10.11	12.69	17.60	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Oct-1999	19.32	16.72	16.14	-8.76	▨	20.56	15.03	14.22	15.86	10.98	13.34	20.83	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Feb-2000	18.68	16.39	15.35	-8.74	▨	20.04	15.1	14.31	16.04	10.29	13.34	20.74	6.69	10.93	10.77	▨	▨	▨	▨	▨	▨	▨	▨	▨
May-2000	18.38	16.12	14.61	-9.09	▨	19.44	14.92	14.09	15.94	10.13	14.12	20.56	6.75	10.84	10.65	▨	▨	▨	▨	▨	▨	▨	▨	▨
Aug-2000	18.38	15.92	15.1	-10.48	▨	19.85	14.78	13.87	21.16	20.92	13.04	19.62	14.42	11.08	10.72	▨	▨	▨	▨	▨	▨	▨	▨	▨
Dec-2000	19.43	16.74	14.48	-12.03	▨	19.61	14.69	14.85	16.18	10.30	12.7	19.51	7.43	11.07	10.99	▨	▨	▨	▨	▨	▨	▨	▨	▨
May-2001	17.93	15.57	13.83	-10.73	19.12	▨	14.07	13.06	14.68	10.20	13.01	17.85	7.46	10.88	10.61	▨	▨	▨	▨	▨	▨	▨	▨	▨
Mar-2002	▨	▨	▨	▨	20.1	▨	15.16	15.27	▨	▨	▨	20.20	7.16	11.28	11.33	▨	▨	▨	▨	▨	▨	▨	▨	▨
Jun-2002	▨	▨	▨	▨	19.32	▨	14.27	12.68	▨	▨	▨	17.96	7.37	10.79	9.77	▨	▨	▨	▨	▨	▨	▨	▨	▨
Sep-2002	▨	▨	▨	▨	17.04	▨	14.13	12.76	▨	▨	▨	14.67	7.65	10.49	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Nov-2002	19.46	15.49	16.62	▨	19.71	▨	15.04	15.26	▨	▨	▨	20.52	9.12	11.53	11.53	▨	▨	▨	▨	▨	▨	▨	▨	▨
Mar-2003	▨	▨	▨	▨	20.21	▨	14.94	13.67	▨	▨	▨	19.72	7.29	11.4	11.25	▨	14.94	▨	▨	▨	▨	▨	▨	▨
Jun-2003	19.33	15.12	15.43	▨	20.36	▨	15.02	14.1	▨	▨	▨	20.67	7.35	11.47	11.38	▨	14.65	▨	▨	▨	▨	▨	▨	▨
Sep-2003	19.09	14.56	13.41	▨	19.60	17.15	14.62	13.66	13.66	10.86	14.06	20.78	7.22	11.23	10.99	▨	14.52	▨	▨	▨	▨	▨	▨	▨
Dec-2003	18.13	14.74	13.89	▨	20.10	▨	14.74	13.64	13.25	10.59	13.78	20.81	6.98	11.09	10.81	▨	14.29	▨	▨	▨	▨	▨	▨	▨
Mar-2004	18.13	15.07	15.48	▨	20.10	▨	14.93	13.79	13.99	10.70	15.74	20.88	6.90	11.22	11.14	▨	14.77	▨	▨	▨	▨	▨	▨	▨
10/6/2004	17.68	15.23	14.41	11.77	19.77	17.05	14.34	14.03	13.65	10.56	17.38	19.33	7.14	11.23	11.12	13.02	13.48	15.27	18.17	8.16	8.65	11.68	12.94	13.26
11/16/04	17.59	14.92	13.91	11.63	19.71	17	14.67	13.96	13.78	11.64	13.53	20.67	7.2	11.3	11.07	13.68	14.24	16.03	18.63	8.47	8.32	12.2	13.24	13.1
12/16/04	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	13.68	14.24	16.03	18.63	8.47	8.32	12.20	13.24	13.10
3/22/2005	18.33	15.39	13.64	16.20	20.26	17.81	14.81	13.94	13.76	10.47	14.24	20.92	7.77	11.48	11.04	15.74	14.63	18.67	19.20	8.72	8.96	13.31	13.39	13.29
6/20/2005	13.41	13.84	13.73	12.48	17.00	17.07	14.00	12.93	13.66	15.16	13.55	17.79	8.88	11.45	10.70	13.21	▨	15.30	16.86	7.23	8.13	11.85	12.58	12.66
8/16/2005	17.72	16.04	13.98	12.56	19.15	13.72	13.77	13.15	14.01	10.77	13.60	17.75	6.98	10.90	10.82	13.01	12.78	14.43	16.74	8.22	8.71	11.25	12.99	12.36
11/18/2005	17.30	15.27	14.67	13.98	20.23	17.01	14.37	13.88	13.56	10.68	14.15	20.72	5.65	11.02	10.75	13.66	13.73	17.84	18.75	8.98	9.11	11.83	13.44	12.42
2/28/2006	18.22	15.74	16.95	14.32	20.19	13.87	21.50	13.53	13.50	13.10	18.51	19.39	6.79	9.08	11.00	14.10	11.20	18.21	18.17	8.53	8.77	11.93	13.88	12.70
5/16/2006	16.20	15.85	11.21	16.39	16.05	13.46	14.95	13.98	13.59	15.38	14.15	15.09	5.98	8.77	9.46	15.66	14.24	17.22	18.84	9.22	7.84	14.12	14.20	10.92
8/22/2006	17.10	16.00	13.06	12.32	18.15	16.33	13.00	11.53	12.27	13.40	12.95	13.96	8.14	10.61	10.73	12.08	12.77	13.85	16.01	7.92	8.30	12.03	12.59	11.08
12/5/2006	17.89	18.78	14.34	16.73	20.92	17.95	14.84	14.76	14.74	13.62	14.37	20.68	8.07	10.75	11.13	15.91	15.40	19.27	19.78	9.23	9.49	13.07	13.36	12.59
2/20/2007	15.62	15.99	20.53	14.96	20.43	17.99	14.32	13.92	14.46	10.47	13.70	16.19	10.62	11.18	10.94	14.10	12.62	18.23	18.92	8.55	8.77	12.56	12.19	11.81
5/14/2007	15.53	15.71	20.34	14.91	20.00	17.70	14.47	13.82	14.45	10.41	13.66	19.42	10.51	10.93	10.76	14.08	12.58	17.35	18.85	8.04	9.22	12.51	11.24	11.68
8/7/2007	▨	▨	12.82	12.15	17.13	▨	12.97	12.93	12.65	▨	13.04	14.60	7.65	9.86	10.52	12.10	12.75	13.27	18.13	7.24	7.67	11.17	10.61	11.51
10/23/2007	▨	13.73	13.37	10.64	15.03	12.95	15.31	11.98	12.03	17.97	12.95	12.18	7.10	10.81	10.06	11.23	11.08	11.79	13.50	5.17	6.33	9.40	9.77	11.19
4/13/2008	18.58	16.44	15.11	12.88	19.84	16.27	13.48	13.58	14.48	10.53	13.62	19.95	8.02	11.52	11.22	22.91	14.27	17.38	18.74	8.61	8.77	12.94	13.72	12.35

REGIONAL LANDFILL HISTORICAL GROUNDWATER ELEVATIONS (ft, AMSL)

WELL ID	DMW-101	DMW-102	DMW-104	DMW-105	DMW-106
Monitoring Event					
Apr-1999	▨	▨	▨	▨	▨
Aug-1999	▨	▨	▨	▨	▨
Oct-1999	▨	▨	▨	▨	▨
Feb-2000	8.09	11..44	▨	▨	▨
May-2000	8.09	11.44	▨	▨	▨
Aug-2000	9.73	11.86	15.24	▨	▨
Dec-2000	8.58	12.01	14.32	▨	▨
May-2001	8.85	12.23	15.55	▨	▨
Mar-2002	8.51	12.56	14.79	▨	▨
Jun-2002	8.55	12.18	14.15	▨	▨
Sep-2002	8.45	11.67	12.08	▨	▨
Nov-2002	9.59	12.37	14.65	▨	▨
Mar-2003	14.56	12.75	18.00	▨	▨
Jun-2003	8.73	12.76	17.93	▨	▨
Sep-2003	8.65	12.45	16.74	▨	▨
Dec-2003	▨	▨	▨	▨	▨
Mar-2004	▨	▨	▨	▨	▨
10/6/2004	8.27	11.48	15.02	7.30	11.75
11/16/04	8.1	11.91	15.06	▨	▨
12/16/04	▨	▨	▨	▨	▨
3/22/2005	8.57	12.51	18.07	8.13	11.52
6/20/2005	10.92	10.94	15.29	7.42	10.07
8/16/2005	8.08	11.96	14.52	▨	8.87
11/18/2005	7.38	12.05	17.20	▨	8.47
2/28/2006	12.84	12.14	14.59	6.33	9.46
5/16/2006	8.28	12.01	17.02	9.73	7.75
8/22/2006	8.40	11.64	13.81	6.41	4.01
12/5/2006	8.87	12.86	18.67	6.92	4.40
2/20/2007	8.37	9.99	16.27	6.37	2.25
5/14/2007	7.53	9.70	15.83	5.48	1.14
8/7/2007	8.07	11.20	13.36	5.28	0.32
10/23/2007	7.90	10.69	11.84	4.20	-2.94
4/13/2008	8.72	11.94	16.7	6.17	-2.26

ft - feet

AMSL - Above Mean Sea Level

▨ Not measured

APPENDIX C

BORING LOGS

•

WELL CONSTRUCTION LOGS

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SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

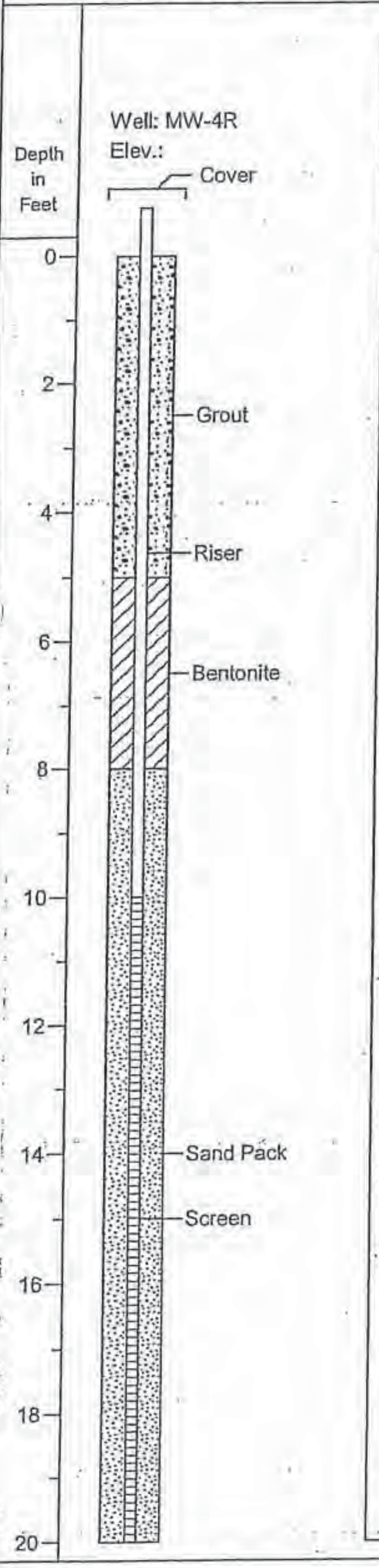
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-25-04/8:00
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-4R

(Page 1 of 1)

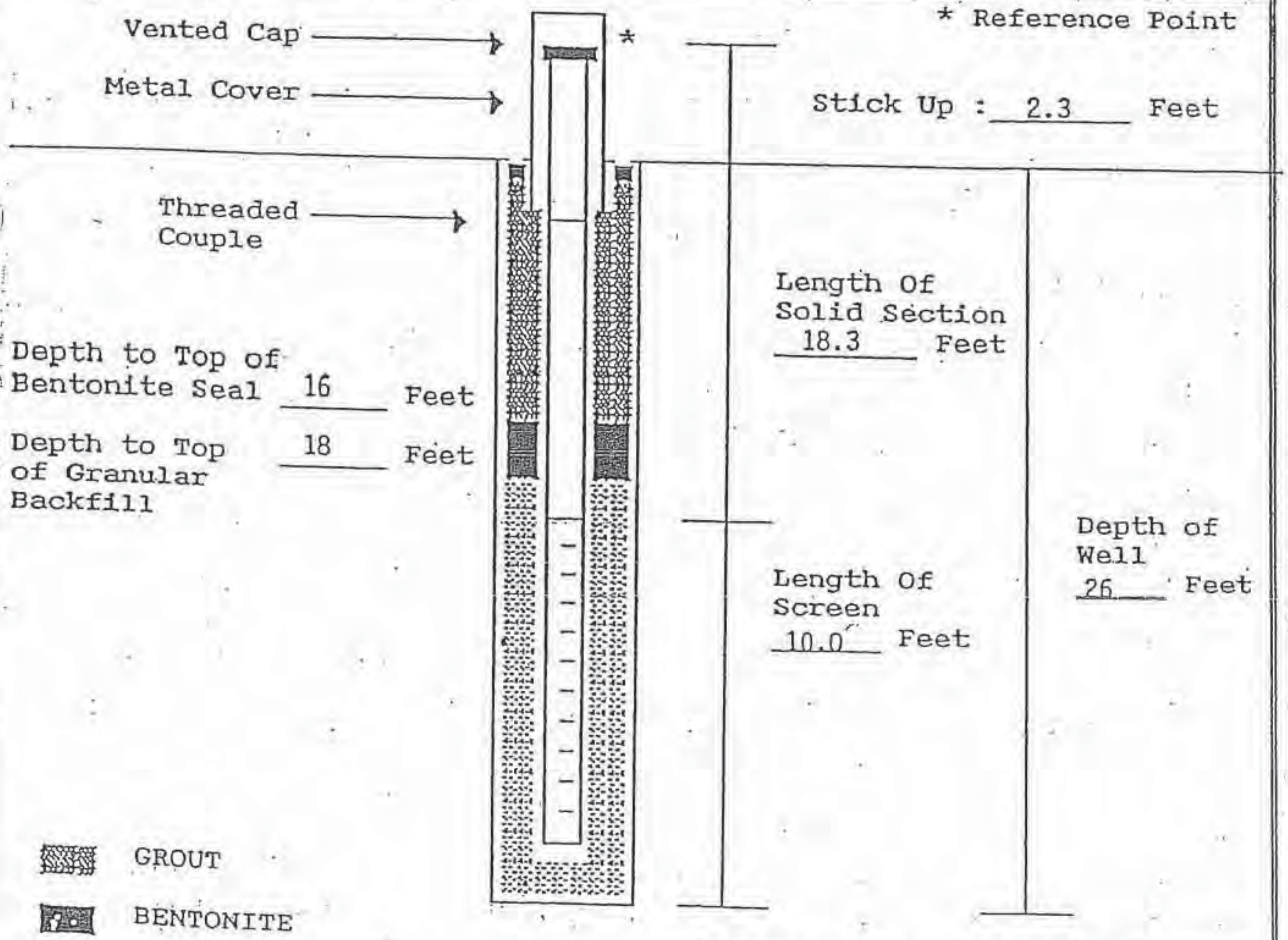
Date Completed: : 08-25-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	GRAPHIC	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	▨	C	7	1	medium grey, stiff, CLAY, traces of silt, moist, no odor
	░	SSI	3	2	light grey/beige with orange, fine grained, SANDY SILT, traces of GRAVEL and CLAY, very moist to wet, no odor
	░	SIS	3	3	medium grey, fine grained, SILTY SAND, traces of CLAY, moist, no odor
	░	S	0	4	medium grey, fine grained, SAND, traces of CLAY and GRAVEL, very moist, no odor End of Boring = 20'

TYPE II MONITORING WELL
INSTALLATION RECORD

PROJECT : SPSA WELL INSTALLATION
PROJECT NUMBER : NKO-E-2712
WELL NUMBER : MW-10
INSTALLATION DATE: 1/6/91
LOCATION : SEE MAP 2 - APPENDIX A
GROUND ELEVATION : N/A
REFERENCE POINT ELEVATION : N/A
BACKFILL MATERIAL : FX99 SAND
SLOT SIZE (INCH): 0.010
SCREEN MATERIAL : PVC
SCREEN DIAMETER (INCHES): 2.0
RISER MATERIAL : PVC
RISER DIAMETER (INCHES) : 2.0
DRILLING TECHNIQUE : AUGER
BOREHOLE DIAMETER (INCHES) : 10
LOCK MODEL: DOLPHIN
KEY CODE OR COMBINATION : 1600



* Reference Point

Stick Up : 2.3 Feet

Length Of Solid Section 18.3 Feet

Depth to Top of Bentonite Seal 16 Feet

Depth to Top of Granular Backfill 18 Feet

Depth of Well 26 Feet

Length Of Screen 10.0 Feet

▨ GROUT

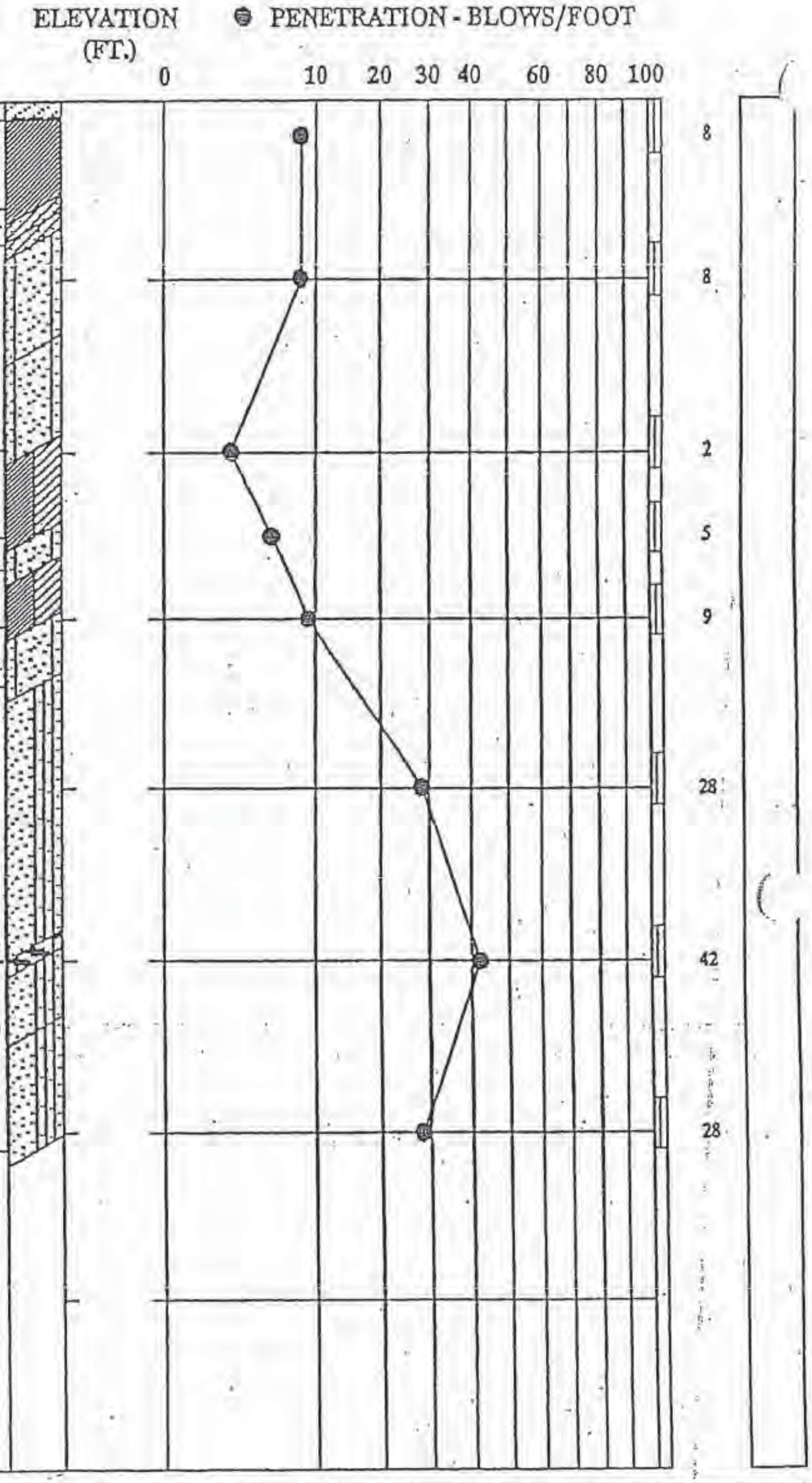
▨ BENTONITE

▨ GRANULAR BACKFILL

STABILIZED WATER LEVEL 5.7 Feet
DATE MEASURED 1/10/91
(From Reference Point)

LAW ENGINEERING
Chesapeake, Virginia

DEPTH (FT.)	DESCRIPTION
0.0	
0.5	6 inches TOPSOIL
	Firm Gray and Brown Mottled Sandy CLAY (CL) with organics
3.0	
3.5	Loose Light Gray Clayey Fine SAND (SC)
4.0	Loose Tan Gray Clayey Fine SAND (SC)
	Loose Wet Gray and Brown Mottled Silty Fine SAND (SM)
7.0	Loose Saturated Gray Silty Fine to Medium SAND (SM) with some clay lenses
9.9	Very Soft Gray Silty Clay (CL-CH)
12.5	
	Loose Tannish Gray Silty Fine SAND (SM)
13.5	Soft Gray Silty CLAY (CL-CH)
15.2	Loose Firm Gray Silty Fine to Medium SAND (SM)
17.0	Firm to Dense Light Gray Slightly Silty Medium SAND (SP-SM)
24.5	
25.0	Silty Fine Gravel (GM) encountered
	Firm to Dense Light Gray Slightly Silty Medium SAND (SP-SM)
27.0	Firm to Dense Light Gray Slightly Silty Medium to Coarse SAND (SP-SM) with some organics
	Large Chunks of Wood (>2" diameter) encountered in borehole.
30.5	Boring terminated at 30.5 feet



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF
SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	MW-10
DATE DRILLED	January 3, 1991
PROJECT NUMBER	NK0-E-2712
PROJECT	SPSA Landfill Site
PAGE 1 OF 1	

LAW ENGINEERING

PROJECT #: **131471**
LOCATION: **SPSA Regional Landfill**
STRUCTURE: **Monitoring Well**

MW-10B

PAGE 1 OF 1

STATION:
OFFSET:
LATITUDE: °N
LONGITUDE: °W
SURFACE ELEVATION: 20.5 ft
COORD. DATUM: NAD 83

Date(s) Drilled: 12/22/2009 - 12/22/2009
Drilling Method(s): Continuous Flight HSA
SPT Method: Automatic Hammer
Other Test(s):
Driller: Fishburne Drilling
Logger: A. White

GROUND WATER
∇ FIRST ENCOUNTERED AT: 4.2 ft DEPTH

FIELD DATA

DEPTH (ft)	ELEVATION (ft)	STANDARD PENETRATION TEST HAMMER BLOWS	% SOIL RECOVERY	SAMPLE INTERVAL	Core Recovery	ROCK QUALITY DESIGNATION	DIP STRATA	DIP JOINTS
4 - 6		2 1 1	20	4 - 6				
8 - 10		1 1 1	0	8 - 10				
14 - 16		3 1 0	30	14 - 16				
16 - 18		1 1 1	90	16 - 18				
18 - 20		1 0 1	100	18 - 20				
20 - 22		0 0 1	90	20 - 22				
22 - 24		2 2 3	100	22 - 24				
24 - 26		0 1 1	100	24 - 26				

DESCRIPTION OF STRATA

0.0 / 20.5
Black Organic CLAY **OH**

4.2 / 16.3
Yellowish Brown to Tan Silty SAND, Wet **SM**

14.0 / 6.5
Olive-Brown Silty SAND with clay, Wet **SM**

16.0 / 4.5
Dark Grey CLAY, Wet **CL**

18.0 / 2.5
Dark Brown Organic CLAY with wood fragments **OH**

21.5 / -1.0
Grey Fine Silty SAND, Wet **SM**

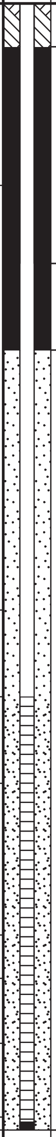
22.5 / -2.0
Grey CLAY with roots, Wet **CL**

24.0 / -3.5
Grey to Brown Organic CLAY with wood fragments and roots **OH**

25.7 / -5.2
Grey Clayey Coarse SAND with roots **SP-SC**

Boring Terminated at 26.2 feet.

WELL DATA



WELL SECTION REMARKS

Cement Grout

Solid PVC Pipe, 2 inch Diameter

Bentonite Seal

#2 Filter Sand

0.010 Slotted PVC Screen, 2 inch Diameter

End Cap

REMARKS: RIG TYPE: CME-75.

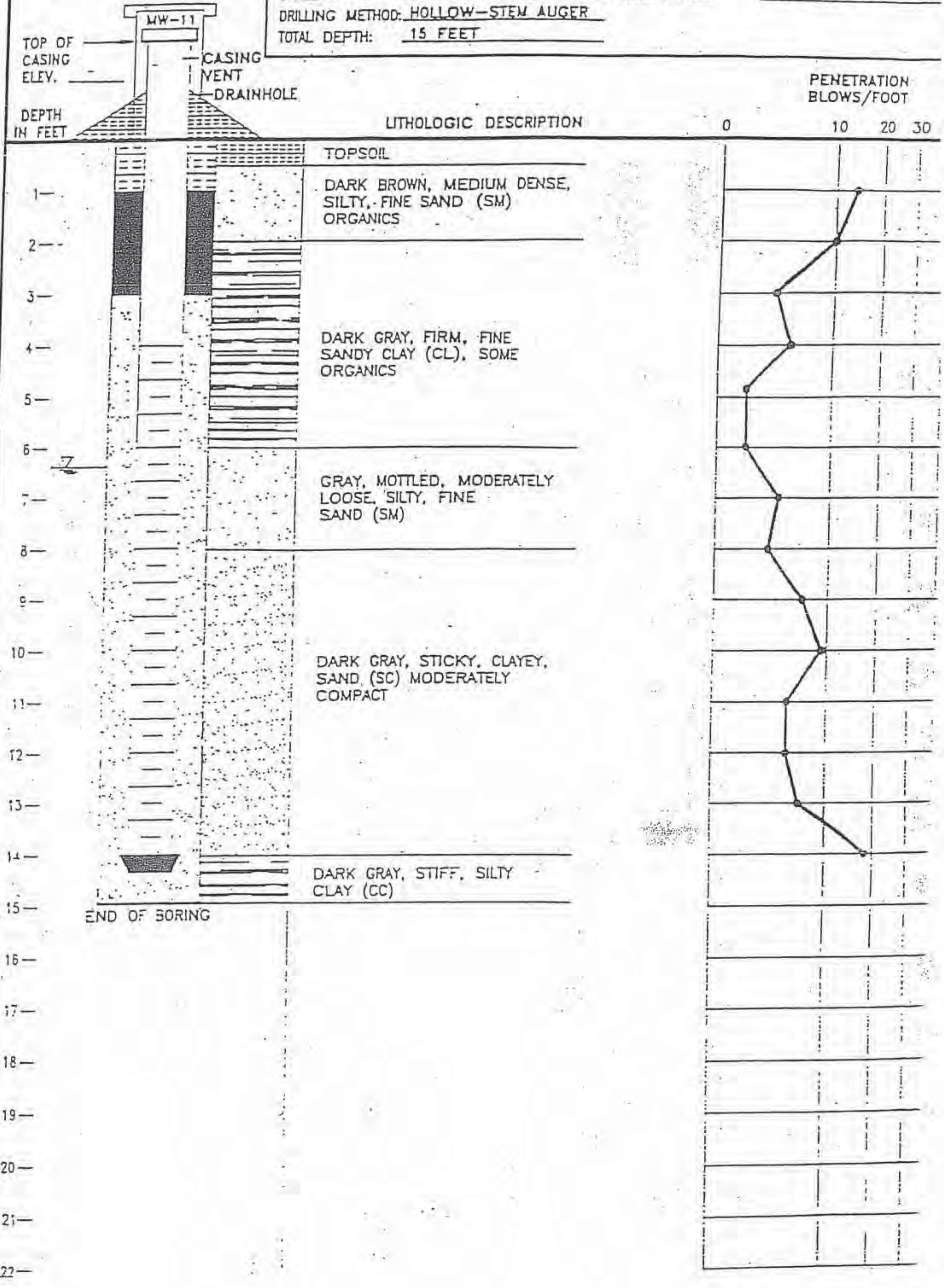
PAGE 1 OF 1

MW-10B

SPT_LOG:SPSA REGIONAL LANDFILL NES WELLS.GPJ:8.1.025:081505:1/14/10

LOG OF MONITORING WELL NO. 11

GEOLOGIST:	BISHOP/RESICHLE	PROJECT:	SPSA REGIONAL LAND.
DATE DRILLED:	07/21/92	SURFACE ELEVATION:	21.50 MSL
DRILLER:	FISHBURNE DRILLING	WATER LEVEL:	6.5 FEET BGL
DRILLING METHOD:	HOLLOW-STEM AUGER		
TOTAL DEPTH:	15 FEET		



TOPSOIL

DARK BROWN, MEDIUM DENSE, SILTY, FINE SAND (SM) ORGANICS

DARK GRAY, FIRM, FINE SANDY CLAY (CL), SOME ORGANICS

GRAY, MOTTLED, MODERATELY LOOSE, SILTY, FINE SAND (SM)

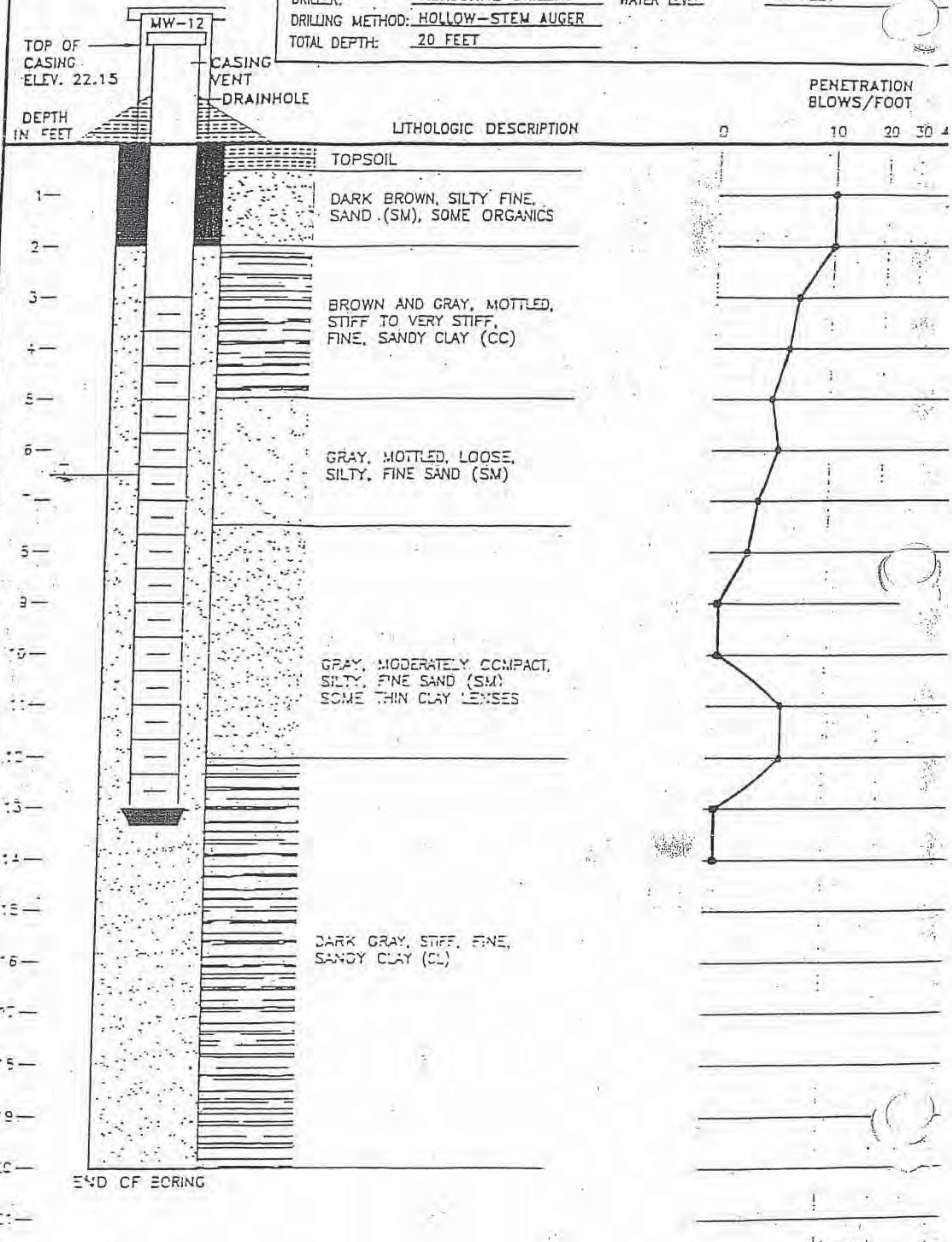
DARK GRAY, STICKY, CLAYEY, SAND (SC) MODERATELY COMPACT

DARK GRAY, STIFF, SILTY CLAY (CC)

END OF BORING

LOG OF MONITORING WELL NO. 12

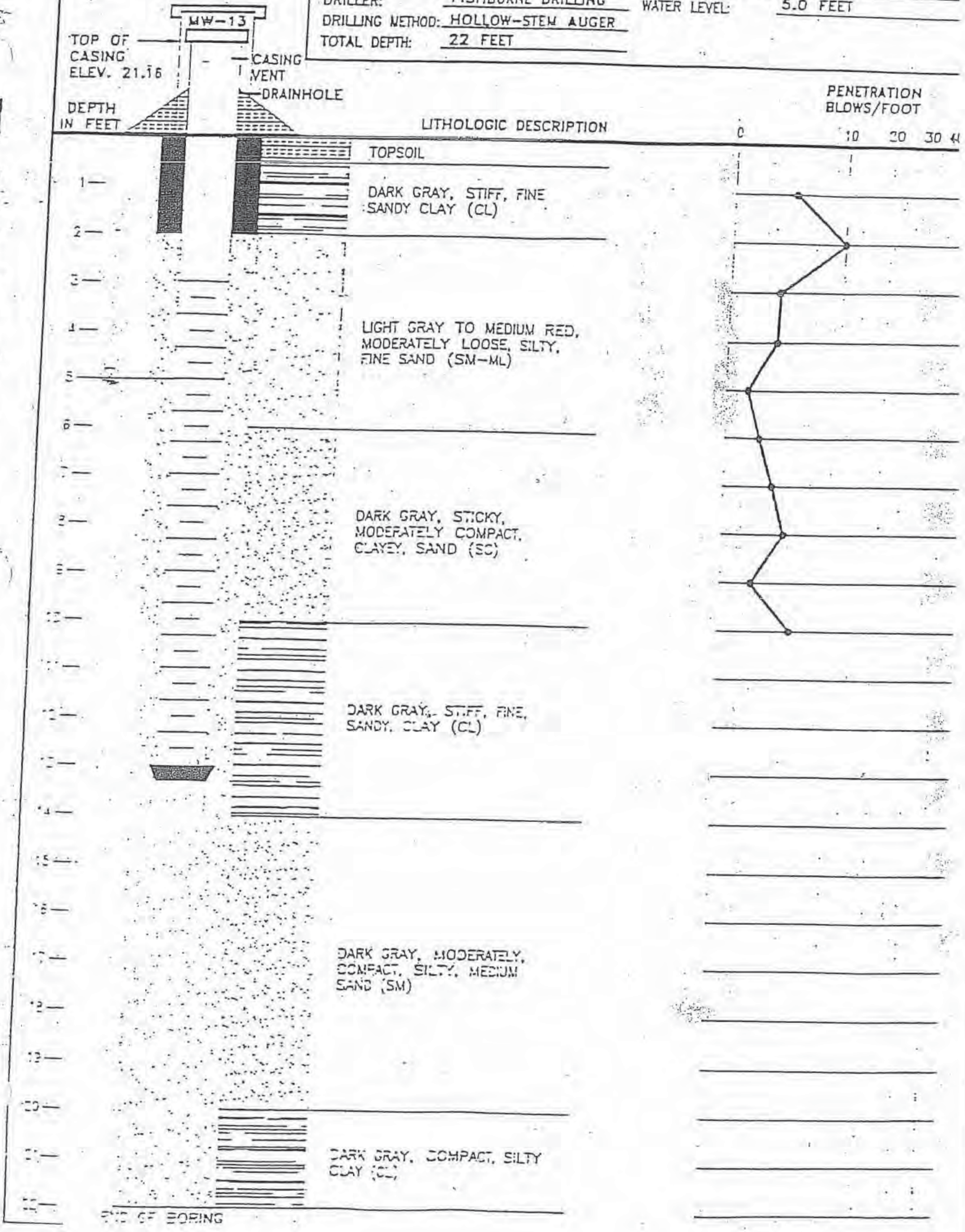
GEOLOGIST:	BISHOP/REICHLE	PROJECT:	SPSA REGIONAL LANDF
DATE DRILLED:	7/21/92	SURFACE ELEVATION:	20.10 MSL
DRILLER:	FISHBURNE DRILLING	WATER LEVEL:	6.5 FEET
DRILLING METHOD:	HOLLOW-STEM AUGER		
TOTAL DEPTH:	20 FEET		



LOG OF MONITORING WELL NO. 13

GEOLOGIST: BISHOP/REICHLE
DATE DRILLED: 7/21/92
DRILLER: FISHBURNE DRILLING
DRILLING METHOD: HOLLOW-STEM AUGER
TOTAL DEPTH: 22 FEET

PROJECT: SPSA REGIONAL LANDF
SURFACE ELEVATION: 19.9 MSL
WATER LEVEL: 5.0 FEET



TOPSOIL

DARK GRAY, STIFF, FINE SANDY CLAY (CL)

LIGHT GRAY TO MEDIUM RED, MODERATELY LOOSE, SILTY, FINE SAND (SM-ML)

DARK GRAY, STICKY, MODERATELY COMPACT, CLAYEY, SAND (SC)

DARK GRAY, STIFF, FINE, SANDY, CLAY (CL)

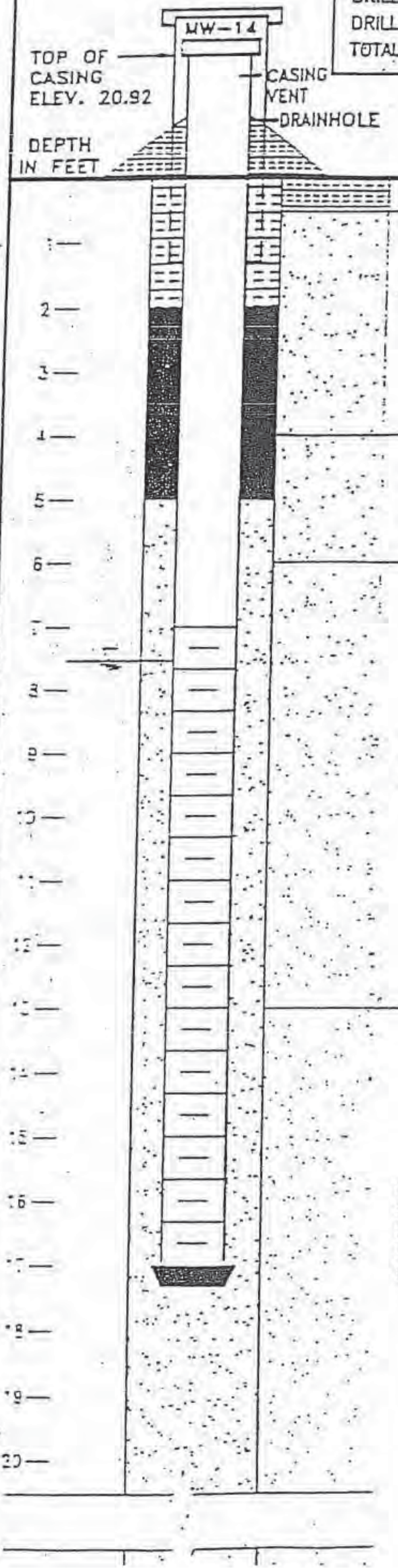
DARK GRAY, MODERATELY, COMPACT, SILTY, MEDIUM SAND (SM)

DARK GRAY, COMPACT, SILTY CLAY (CL)

END OF BORING

LOG OF MONITORING WELL NO. 14

GEOLOGIST: BISHOP/REICHLE
DATE DRILLED: 7/21/92
DRILLER: FISHBURNE DRILLING
DRILLING METHOD: HOLLOW-STEM AUGER
TOTAL DEPTH: 26 FEET
PROJECT: SPSA REGIONAL LAN
SURFACE ELEVATION: 18.0 MSL
WATER LEVEL: 7.5 FEET BGL



LITHOLOGIC DESCRIPTION

PENETRATION BLOWS/FOOT
0 10 20 30

TOPSOIL

GRAY-BROWN, MOTTLED SILTY FINE SAND (SM) TRACE ORGANICS

LIGHT GRAYISH-BROWN, FINE TO MEDIUM SAND (SW) FAIRLY CLEAN, DRY

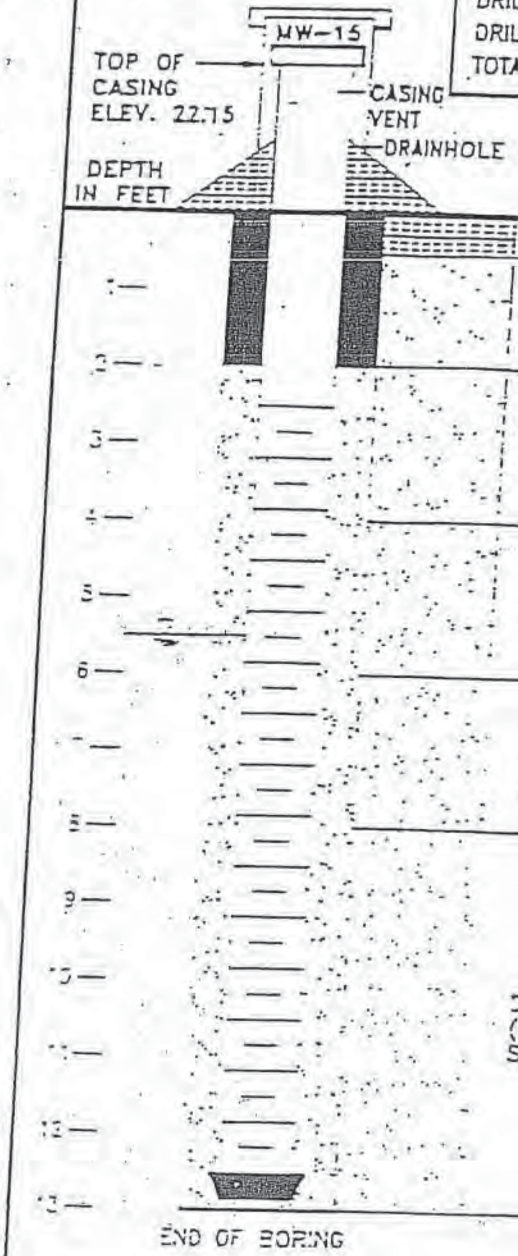
LIGHT GRAYISH-BROWN, FINE TO MEDIUM SAND (SM) MOIST, SATURATED AT 12', MOTTLED

RED-BROWN FINE TO MEDIUM SILTY SAND (SM) BECOMING MORE RED AND COARSE WITH DEPTH WITH LESS AMOUNTS OF SILT

LOG OF MONITORING WELL NO. 15

GEOLOGIST: BISHOP/REICHLE
DATE DRILLED: 11/18/92
DRILLER: FISHBURNE DRILLING
DRILLING METHOD: HOLLOW-STEM AUGER
TOTAL DEPTH: 13 FEET

PROJECT: SPSA REGIONAL LANDF
SURFACE ELEVATION: 20.10 MSL
WATER LEVEL: 6.5 FEET



LITHOLOGIC DESCRIPTION

TOPSOIL

MEDIUM-BROWN, SILTY, FINE, SAND (SM)

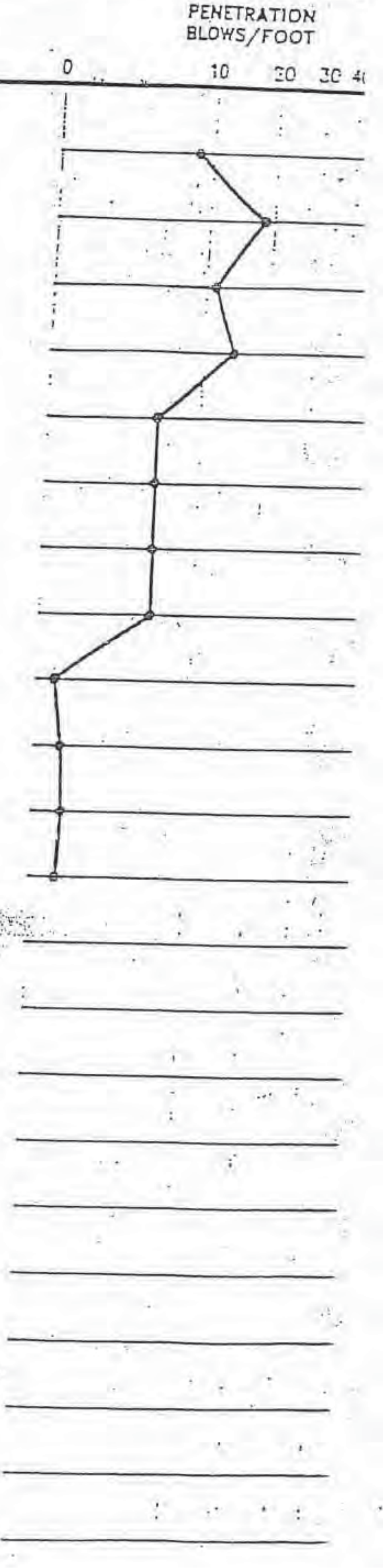
MEDIUM GRAY, VERY FINE, SILTY SAND (SM) SOME MINOR AMOUNTS OF ORGANICS

LIGHT GRAY, VERY FINE SILTY SAND (SM) WITH BRIGHT RED MOTTLES

LIGHT GRAY, FINE SAND (SM) WITH SOME SILT AND BRIGHT RED MOTTLES, SATURATED

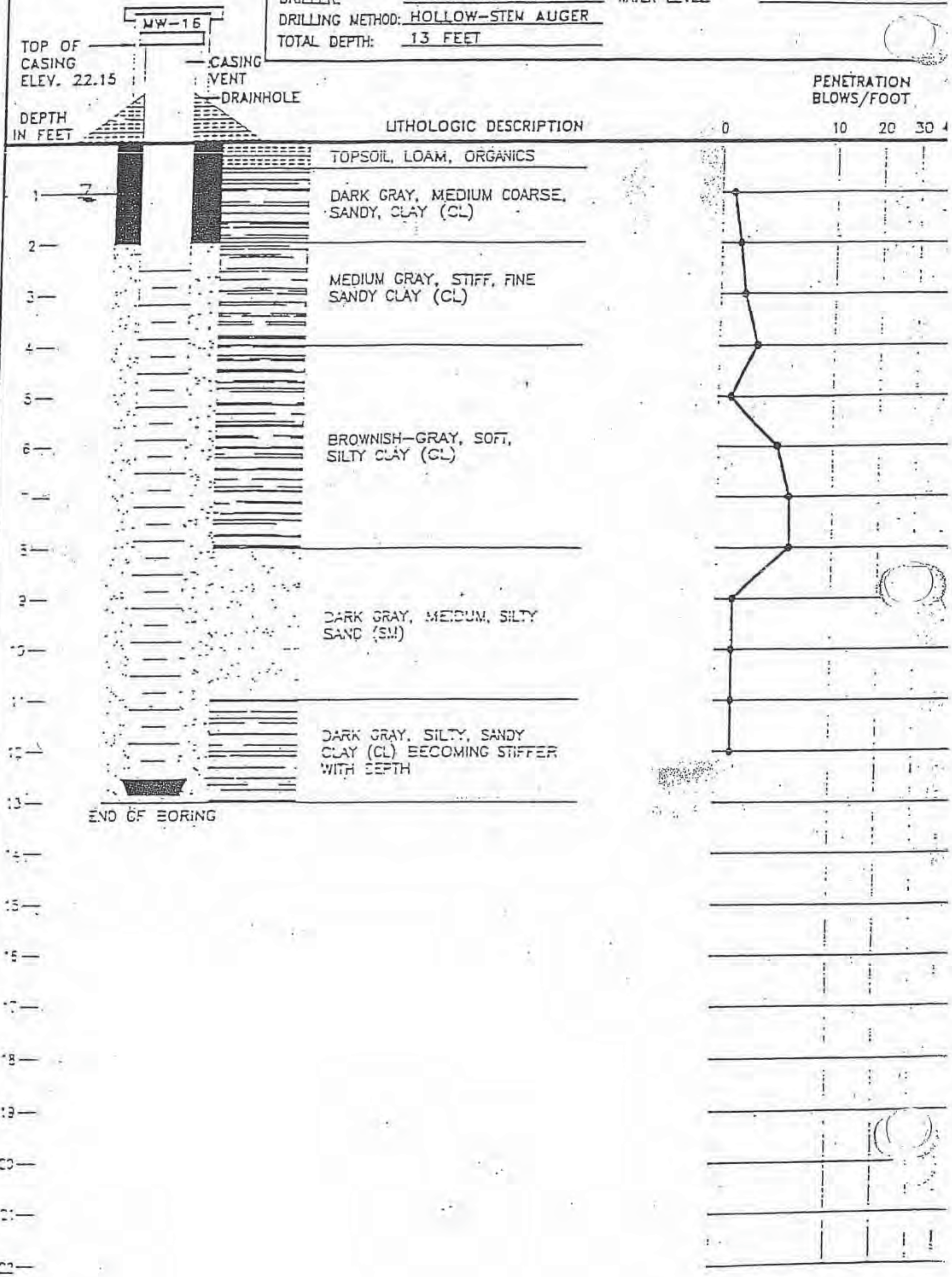
DARK GRAY, MEDIUM SAND (SM) WITH SILT (SM), SATURATED

END OF BORING



LOG OF MONITORING WELL NO. 16

GEOLOGIST: BISHOP/REICHLE
DATE DRILLED: 11/18/92
DRILLER: FISHBURNE DRILLING
DRILLING METHOD: HOLLOW-STEM AUGER
TOTAL DEPTH: 13 FEET
PROJECT: SPSA REGIONAL LANDF
SURFACE ELEVATION:
WATER LEVEL:



TOPSOIL, LOAM, ORGANICS

DARK GRAY, MEDIUM COARSE, SANDY, CLAY (CL)

MEDIUM GRAY, STIFF, FINE SANDY CLAY (CL)

BROWNISH-GRAY, SOFT, SILTY CLAY (CL)

DARK GRAY, MEDIUM, SILTY SAND (SM)

DARK GRAY, SILTY, SANDY CLAY (CL) BECOMING STIFFER WITH DEPTH

Project No: 01743-077-018

Project: SPSA Regional Landfill

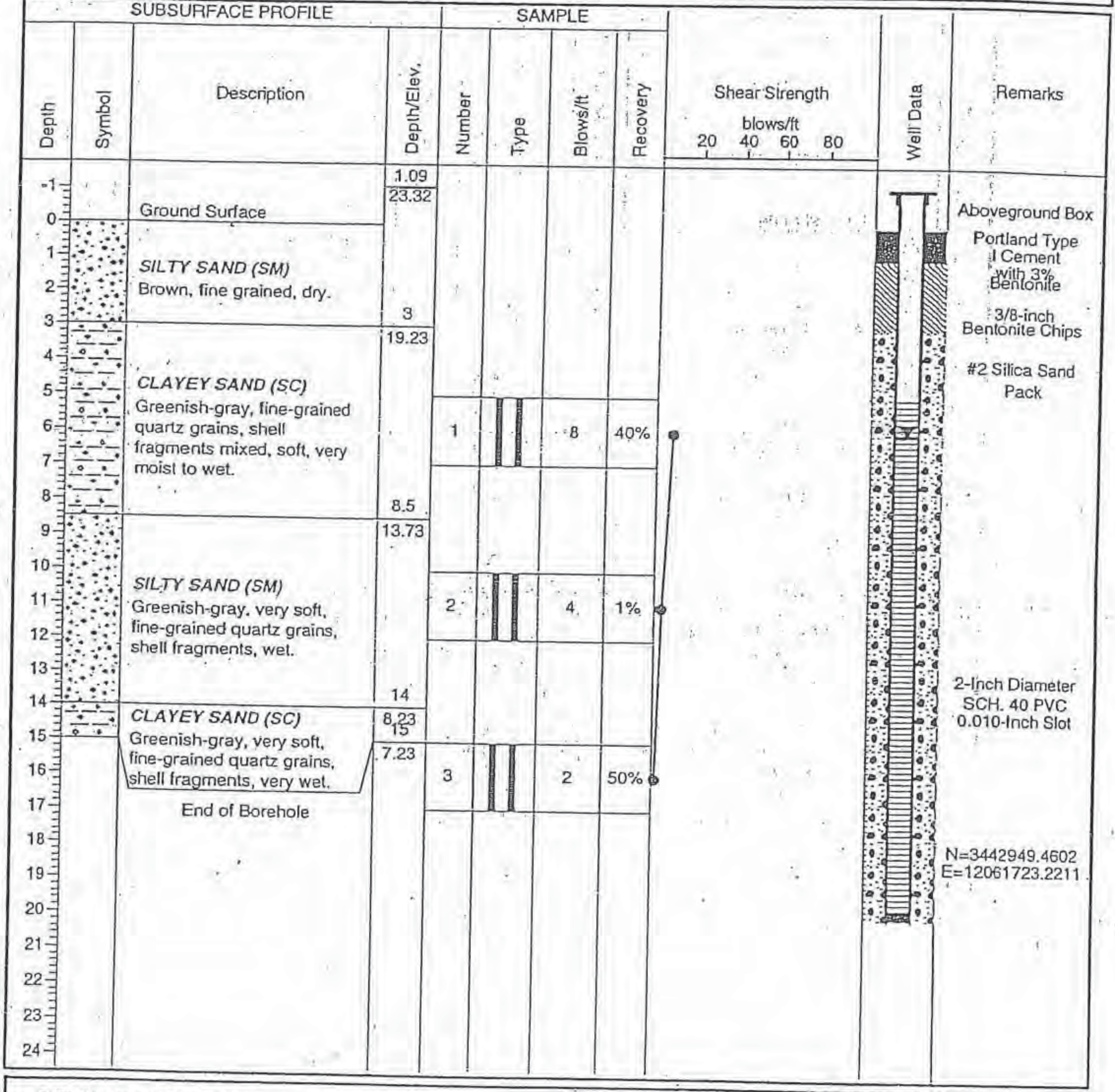
Client: Southeastern Public Service Authority

Location: Suffolk, VA.

Geologist Log B-17 (MW-17)

Ground Elevation: 22.23' MSL

Geologist: John R. Isham, CPG.



SUBSURFACE PROFILE / SAMPLE

Depth	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Well Data / Remarks
-1		1.09 23.32					Aboveground Box
0	Ground Surface						Portland Type I Cement with 3% Bentonite
0–3	*SILTY SAND (SM)* Brown, fine grained, dry.	3 19.23					3/8-inch Bentonite Chips
3–8.5	*CLAYEY SAND (SC)* Greenish-gray, fine-grained quartz grains, shell fragments mixed, soft, very moist to wet.	8.5 13.73	1		8	40%	#2 Silica Sand Pack
8.5–14	*SILTY SAND (SM)* Greenish-gray, very soft, fine-grained quartz grains, shell fragments, wet.	14 8.23	2		4	1%	2-Inch Diameter SCH. 40 PVC 0.010-Inch Slot
14–15	*CLAYEY SAND (SC)* Greenish-gray, very soft, fine-grained quartz grains, shell fragments, very wet.	15 7.23	3		2	50%	
	End of Borehole						N=3442949.4602 E=12061723.2211

Drilled by: Rock Ray Drilling

Drill Method: 4.25-inch ID HSA

Drill Date: November 2, 1999

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 8-inch

Top-of-Casing: 23.32' MSL

Sheet: 1 of 1

Project No: 01743-077-018

Project: SPSA Regional Landfill

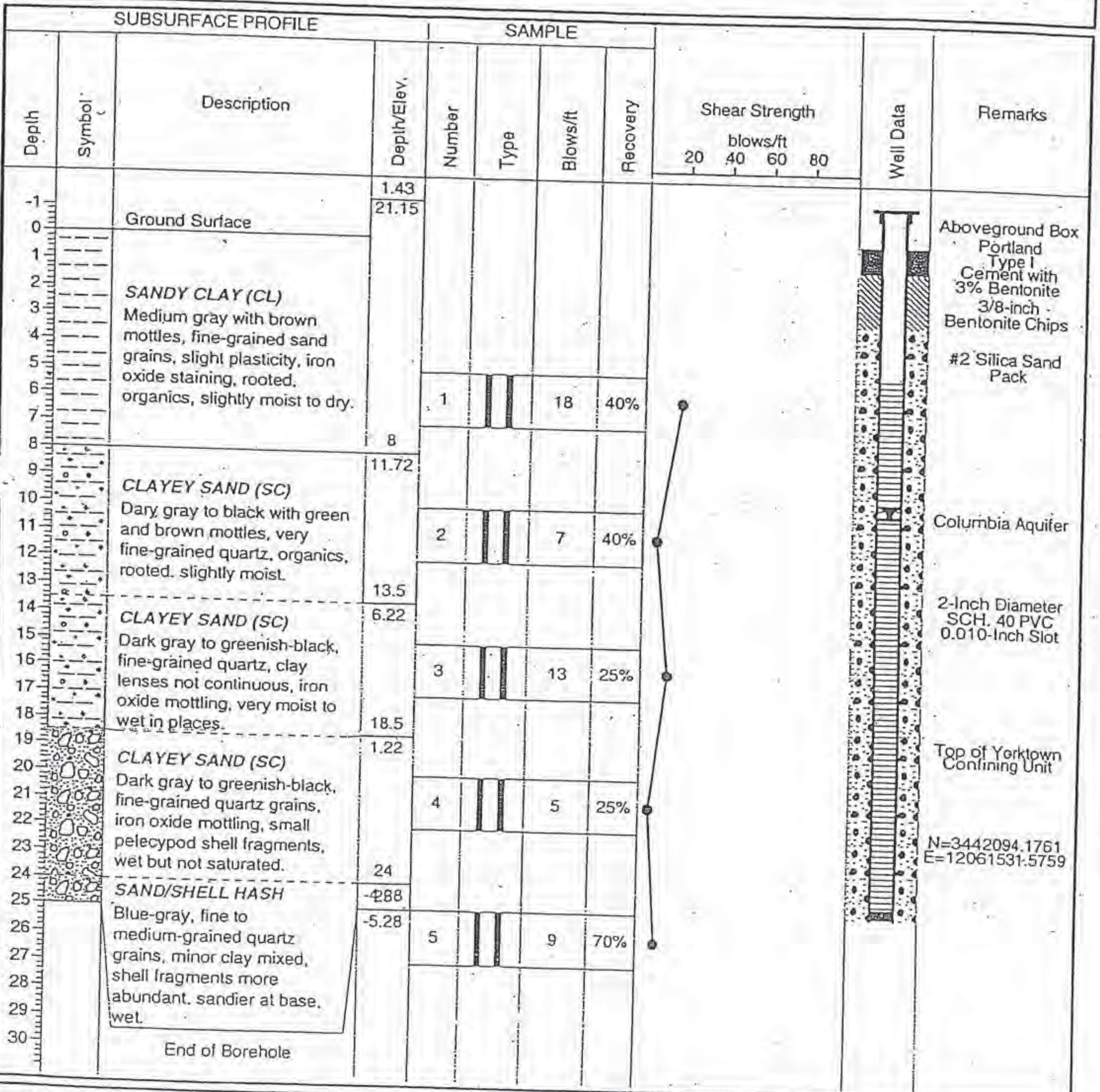
Client: Southeastern Public Service Authority

Location: Suffolk, VA.

Geologist Log B-18 (MW-18)

Ground Elevation: 19.72' MSL

Geologist: John R. Isham, CPG.



Depth/Elev.	Description
1.43 21.15	Ground Surface
	SANDY CLAY (CL) Medium gray with brown mottles, fine-grained sand grains, slight plasticity, iron oxide staining, rooted, organics, slightly moist to dry.
8 11.72	*CLAYEY SAND (SC)* Dary gray to black with green and brown mottles, very fine-grained quartz, organics, rooted, slightly moist.
13.5 6.22	*CLAYEY SAND (SC)* Dark gray to greenish-black, fine-grained quartz, clay lenses not continuous, iron oxide mottling, very moist to wet in places.
18.5 1.22	*CLAYEY SAND (SC)* Dark gray to greenish-black, fine-grained quartz grains, iron oxide mottling, small pelecypod shell fragments, wet but not saturated.
24 -4.28	*SAND/SHELL HASH* Blue-gray, fine to medium-grained quartz grains, minor clay mixed, shell fragments more abundant, sandier at base, wet.
-5.28	End of Borehole

Number	Type	Blows/ft	Recovery
1		18	40%
2		7	40%
3		13	25%
4		5	25%
5		9	70%

Remarks

Aboveground Box

Portland Type I Cement with 3% Bentonite

3/8-inch Bentonite Chips

#2 Silica Sand Pack

Columbia Aquifer

2-Inch Diameter SCH. 40 PVC 0.010-Inch Slot

Top of Yorktown Confining Unit

N=3442094.1761
E=12061531.5759

Drilled by: Rock Ray Drilling

Drill Method: 4.25-inch ID HSA

Drill Date: November 2, 1999

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 8-inch

Top-of-Casing: 21.15' MSL

Sheet: 1 of 1

Project No: 01743-077-018

Project: SPSA Regional Landfill

Client: Southeastern Public Service Authority

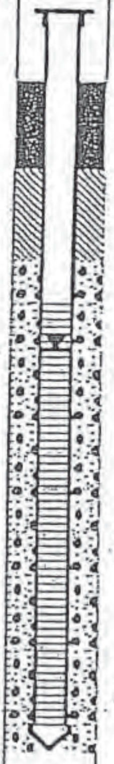
Location: Suffolk, VA.

Geologist Log B-19 (MW-19)

Ground Elevation: 16.02' MSL

Geologist: Sue L. Young, CPG

Depth	SUBSURFACE PROFILE Description	Depth/Elev.	SAMPLE Number	Type	Blows/ft	Recovery
-1		1.58 17.6				
0	Ground Surface					
0–6	*FILL MATERIAL* Interval Not Sampled.	6	1		3	8%
6–8	*SILTY SAND (SM)* Gray, fine grained, trace of clay, some iron oxide mottling, wet.	10.02 8	2		5	17%
8–14	*SILTY SAND (SM)* Gray, fine grained, trace of small wood fragments, iron oxide mottling, wet.	8.02 14	3		5	17%
14–15	*SILTY SAND (SM)* Gray, coarse grained, trace of black broken shell fragments, saturated.	2.02 15 1.02	4		39	50%
	End of Borehole					



Remarks

Aboveground B

Portland Type I Cement with 3% Bentonite

3/8-inch Bentonite Chip

#3 Silica Sanc Pack

2-Inch Diamete SCH. 40 PVC 0.010-Inch Slo

Top of Yorktow Confining Uni

N=3441298.75(E=12061432.86

Drilled by: Rock Ray Drilling

Drill Method: 4.25-inch ID HSA

Drill Date: October 29, 1999

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 8-inch

Top-of-Casing: 17.60' MSL

Sheet: 1 of 1

Project No: 01743-077-018

Project: SPSA Regional Landfill

Client: Southeastern Public Service Authority

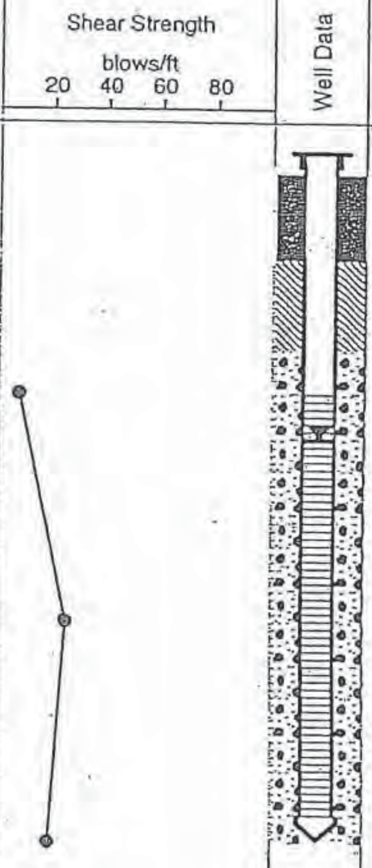
Location: Suffolk, VA.

Geologist Log B-20 (MW-20)

Ground Elevation: 17.97' MSL

Geologist: Sue L. Young, CPG.

Depth	Description	Depth/Elev.	Sample Number	Type	Blows/ft	Recovery	Remarks
0	Ground Surface	0.46 18.43					Aboveground Box Portland Type I Cement with 3% Bentonite 3/8-inch Bentonite Chips #3 Silica Sand Pack
0–7.5	*SILTY SAND (SM)* Gray, fine grained, trace of clay, some iron oxide mottling, white gravel mixed, wet.		1		8	33%	
7.5–12.5	*SILTY SAND (SM)* Gray, fine grained, trace of shell fragments, moist.	7.5 10.47	2		25	100%	2-Inch Diameter SCH. 40 PVC 0.010-Inch Slot
12.5–15	*SILTY SAND (SM)* Gray, fine grained, trace of shell fragments, wet.	12.5 5.47	3		19	100%	Top of Yorktown Confining Unit
15	End of Borehole	15 2.97					N=3441267.0496 E=12061687.8326



Drilled by: Rock Ray Drilling

Drill Method: 4.25-inch ID HSA

Drill Date: October 29, 1999

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 8-inch

Top-of-Casing: 18.43' MSL

Sheet: 1 of 1

Project No: 01743-077-018

Project: SPSA Regional Landfill

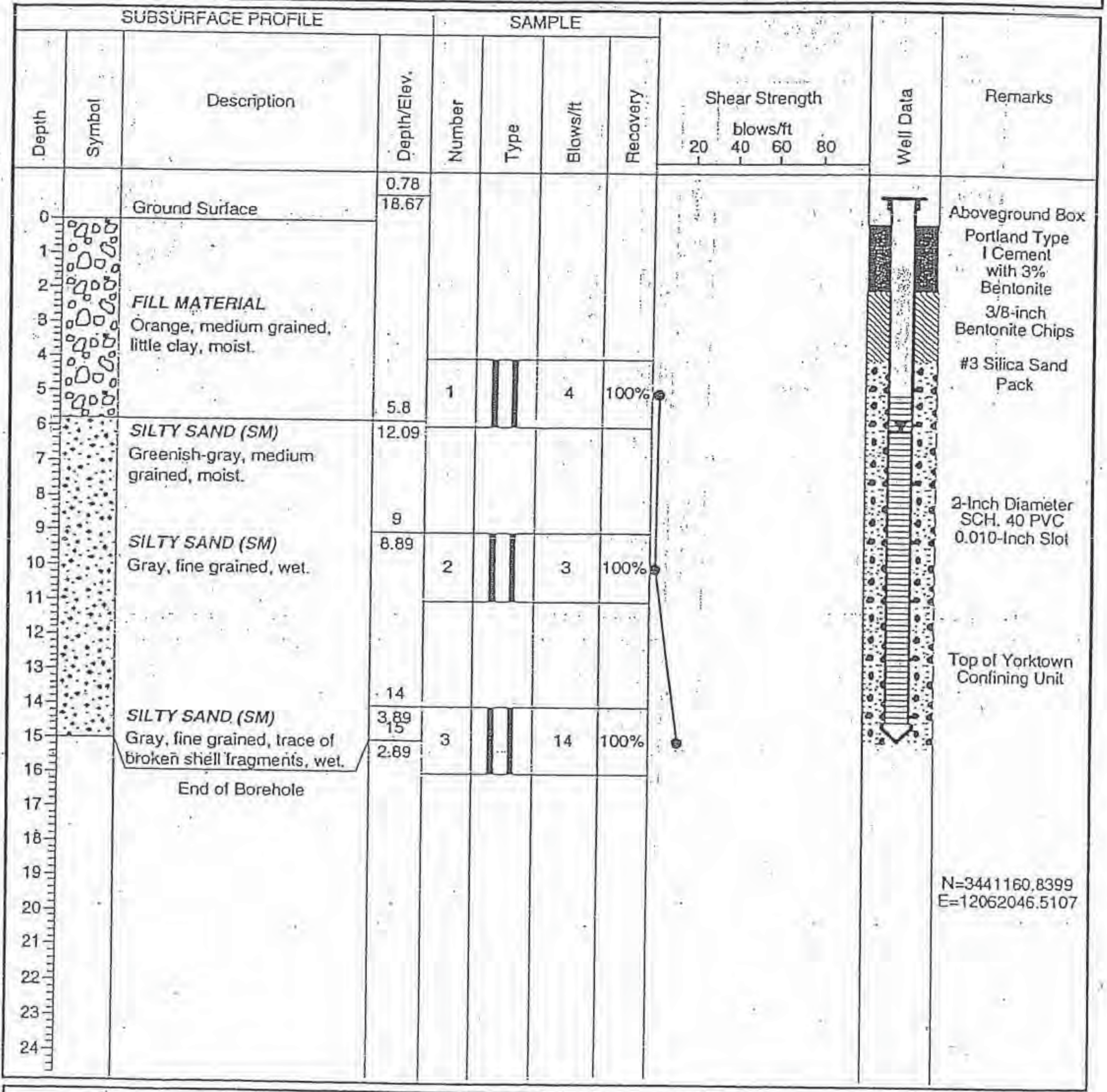
Client: Southeastern Public Service Authority

Location: Suffolk, VA.

Geologist Log B-21 (MW-21)

Ground Elevation: 17.89' MSL

Geologist: Sue L. Young, CPG.



Drilled by: Rock Ray Drilling

Drill Method: 4.25-inch ID HSA

Drill Date: October 29, 1999

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 8-inch

Top-of-Casing: 18.67' MSL

Sheet: 1 of 1

Project No: 01743-077-018

Project: SPSA Regional Landfill

Client: Southeastern Public Service Authority

Location: Suffolk, VA.

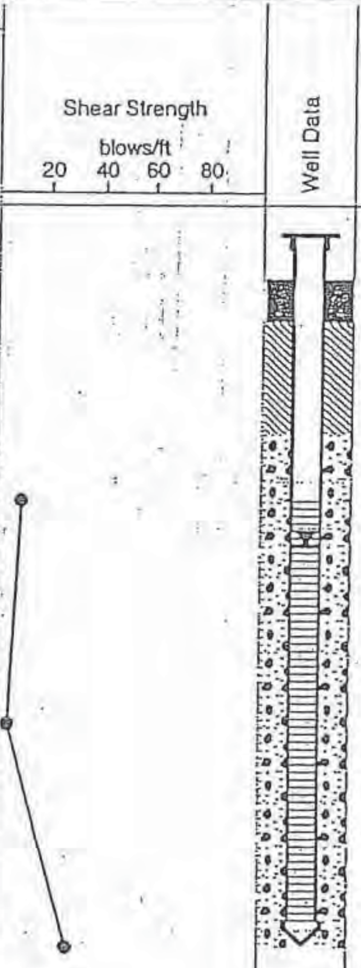
Geologist Log B-22 (MW-22)

Ground Elevation: 22.04' MSL

Geologist: Sue L. Young, CPG.

HDR

SUBSURFACE PROFILE				SAMPLE			
Depth	Symbol	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery
			0.99 23.03				
0		Ground Surface					
0–8		*SANDY SILT (ML)* Brown and gray, mottled, fine-grained sand mixed, wet.		1		10	100%
8–12.5		*SILT (ML)* Gray, trace of fine-grained quartz sand, wet.	8 14.04	2		6	33%
12.5–15		*SILTY SAND (SM)* Gray to white, coarse grained, black broken shell fragments, wet.	12.5 9.54				
15		End of Borehole	15 7.04	3		28	50%



Remarks

Aboveground Box

Portland Type I Cement with 3% Bentonite

3/8-inch Bentonite Chips

#3 Silica Sand Pack

2-Inch Diameter SCH. 40 PVC 0.010-Inch Slot

Top of Yorktown Confining Unit

N=3440977.1397
E=12062791.2823

rilled by: Rock Ray Drilling

Drill Method: 4.25-inch ID HSA

Drill Date: October 29, 1999

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 8-inch

Top-of-Casing: 23.03' MSL

Sheet: 1 of 1

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

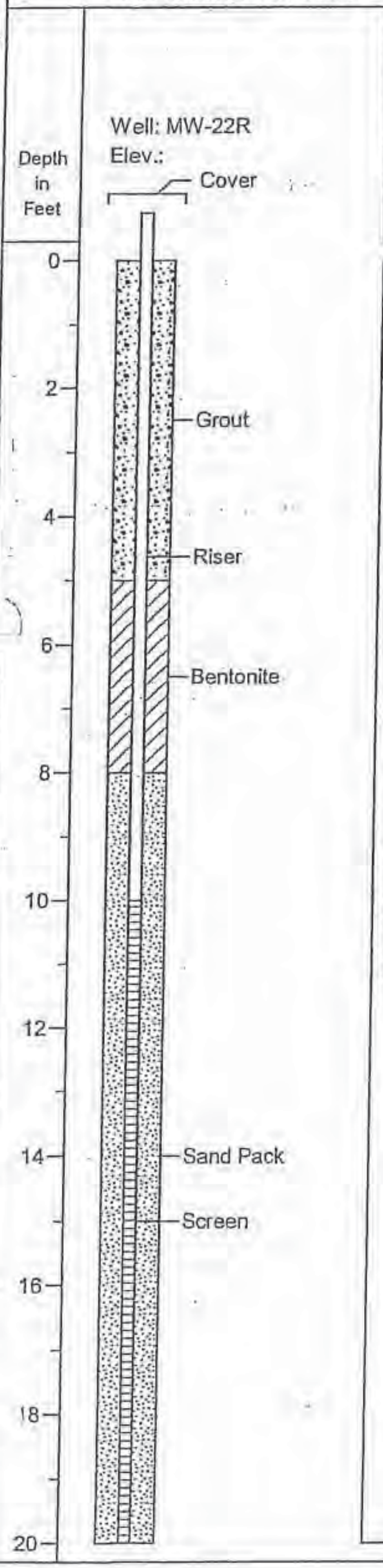
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-24-04/10:05
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-22R

(Page 1 of 1)

Date Completed: : 08-24-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	SIC	6	1	orange/beige, SILTY CLAY, traces of very fine grained SAND, some organic material, moist, no odor
	CS	2	2	mostly grey some orange/beige, fine grained, CLAYEY SAND, traces of silt, very moist to wet, no odor
	S	4	3	grey/beige, fine to medium grained, SAND, traces of clay, very moist, no odor
		10	4	grey/beige, medium grained, loose, SAND, traces of GRAVEL, very moist to wet, no odor End of Boring = 20'

FEB 1 0 2003

By

SCS ENGINEERS

Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

Client: SPSA
Facility Name: SPSA Regional Landfill
Location: Suffolk, VA

SCS File No. 02201028.02 Task 1

WELL CONSTRUCTION
Date Completed : 1/9/03
Hole Diameter : 8"
Drilling Method : HSA (4.25 ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" I.D.
Joints : threaded
Opening : 0.010" slot
SAND PACK : #2 sand

LOG OF BORING MW-23

(Page 1 of 1)

Date: : 1/09/03
Logged By: : Brad Blase
Driller Company: : Fishburne Drilling
Driller: : L. Fishburne
Sample Method: : 2" split spoon ASTM D-1586

COMMONWEALTH OF VIRGINIA
Bradley C. Blase
BRADLEY C. BLASE
No. 1273
CERTIFIED PROFESSIONAL GEOLOGIST

Depth in Feet	Formation	GRAPHIC	USCS	Blow Count	DESCRIPTION
0	Columbia Formation			5 7	dark brown organic SANDY CLAY (soil), moist
1			SM	12 8 2 2	tan - light brown SILTY FINE SAND, moist, trace roots and organics
5			SC	4 4 2 3	light brown - orange - beige SILTY SAND grading to CLAYEY SAND, wet, some organics
9			SM	6 7 2 1	gray SILTY FINE SAND, soft, wet, trace of beige/tan CLAY
14	Yorktown Formation		SC	1 1	black - dark brown organic CLAYEY SAND with greenish gray SANDY CLAY, some silt, more clay with depth
18				1 1 1 1	greenish gray CLAYEY FINE SAND, some silt and shell fragments, soft, wet
23				4 4 4 4	greenish-gray SILTY CLAY and FINE SAND, some shell fragments, soft, wet end of boring = 25'

01-28-2003 - f:\Projects\LF\SPSA\SPSA-Regional\Data\MW-23.BOR

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

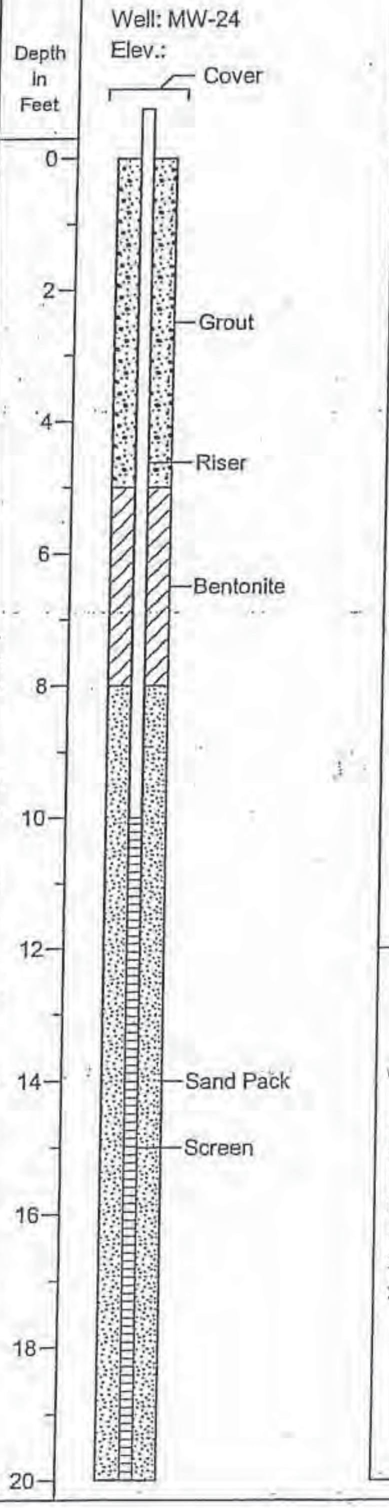
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

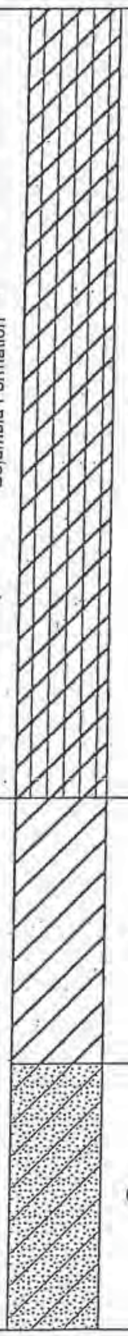
WELL CONSTRUCTION
Date/Time Started : 08-24-04/11:45
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-24

(Page 1 of 1)

Date Completed: : 08-24-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon





Formation	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	SIC	6	1	light gray some orange/beige, SILTY CLAY, some organic material, very moist, no odor
		2	2	medium grey, SILTY CLAY, some organic material, traces of SAND, moist, no odor
Yorktown Formation	C	4	3	greenish medium grey, stiff, CLAY, traces of SAND, very moist, no odor
	CS	10	4	greenish medium grey, fine to medium grained, CLAYEY SAND, very moist to wet, no odor End of Boring = 20'

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

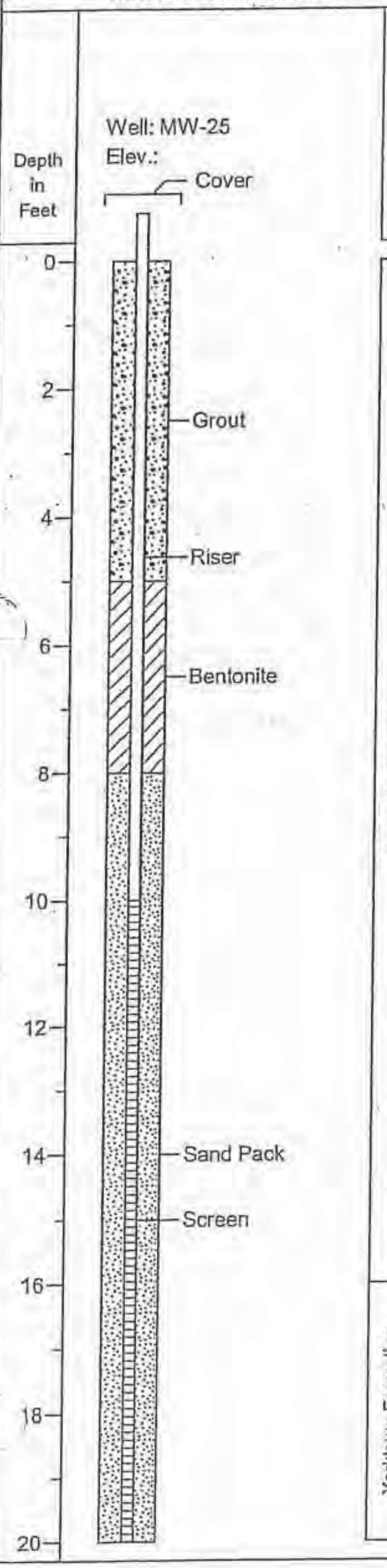
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-24-04/13:00
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-25

(Page 1 of 1)

Date Completed: : 08-24-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Depth in Feet	Formation	GRAPHIC	USCS	Blow Count	Sample	DESCRIPTION
0–7	Columbia Formation		SSI	7	1	orange/beige some gray, very fine grained, SANDY SILT, traces of clay, some organic material, very moist to wet, no odor
7–12			SIC	9	2	medium grey some beige/orange, SILTY CLAY, traces of very fine grained sand, some organic material, moist, no odor
12–16			SC	7	3	medium grey, fine grained, SANDY CLAY, traces of silt, very moist, no odor
16–20	Yorktown Formation		CS	11	4	greenish medium grey, fine grained, CLAYEY SAND, traces of silt, some shell fragments, very moist, no odor End of Boring = 20'

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

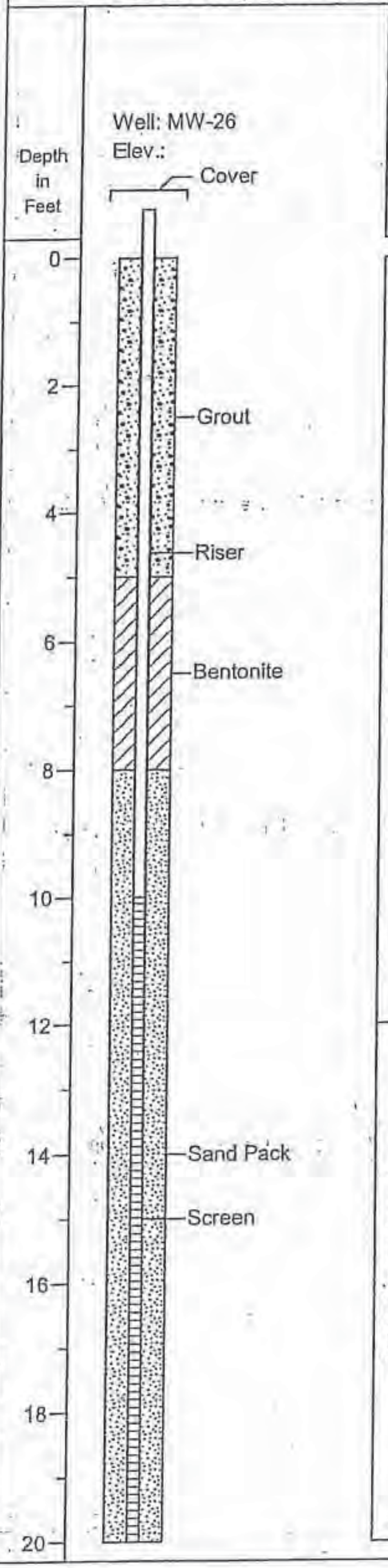
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-25-04/13:40
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-26

(Page 1 of 1)

Date Completed: : 08-25-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	GRAPHIC	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation		SSI	3	1	dark brown/dark grey, SANDY SILT, with organic material, traces of clay, slightly moist,
		S	4	2	medium to dark grey, SAND, with organic material, moist, no odor
Yorktown Formation		SIC	8	3	greenish grey, SILTY CLAY, some shell fragments, slightly moist, no odor
			10	4	greenish grey, SILTY CLAY, some shell fragments, slightly moist, no odor End of Boring = 20'

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

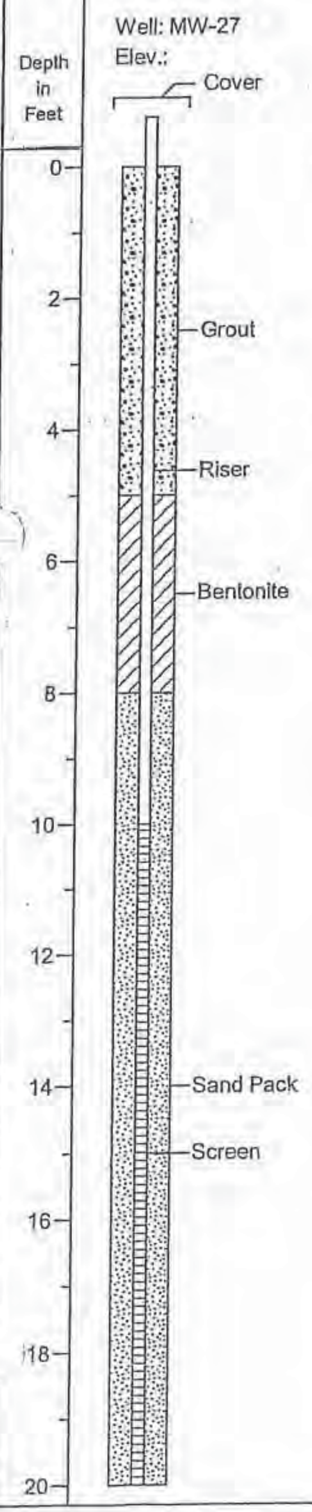
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-25-04/11:45
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-27

(Page 1 of 1)

Date Completed: : 08-25-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	GRAPHIC	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation		S	18	1	light brown/light grey, fine grained, SAND, traces of SILT, very moist, no odor
			14	2	biege/light grey with black flex, fine to medium grained, SAND, very moist to wet, no odor
		SC	12	3	medium gray, fine grained, SANDY CLAY, traces of SILT, some organic material, moist, no odor
Yorktown Formation		SIC	13	4	greenish grey, SILTY CLAY, traces of very fine grained SAND, slightly moist, no odor End of Boring = 20'

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

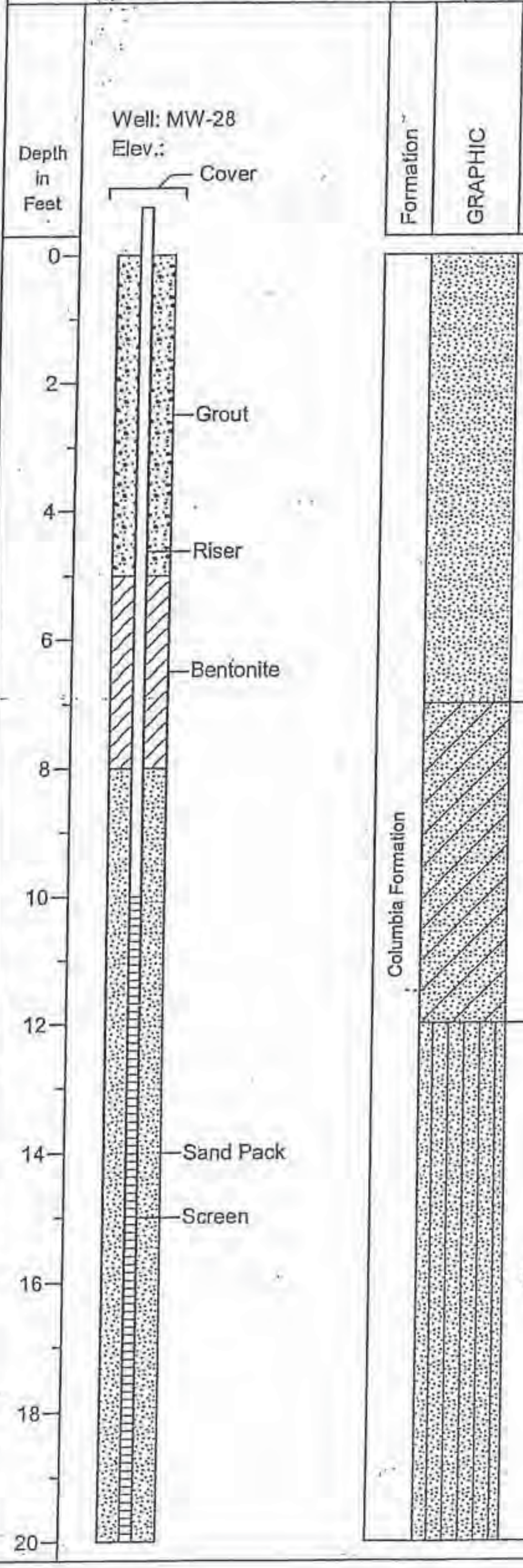
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-25-04/11:00
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-28

(Page 1 of 1)

Date Completed: : 08-25-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	S	14	1	light brown/orange, fine to medium grained, SAND, traces of SILT and GRAVEL, slightly moist, no odor
	CS	5	2	medium gray, fine grained, CLAYEY SAND, some organic material, moist, no odor
	SIS	20	3	light grey/beige, fine grained, SILTY SAND, very moist, no odor
		16	4	light grey/beige, fine grained, SILTY SAND, some organic material, very moist, no odor End of Boring = 20'

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

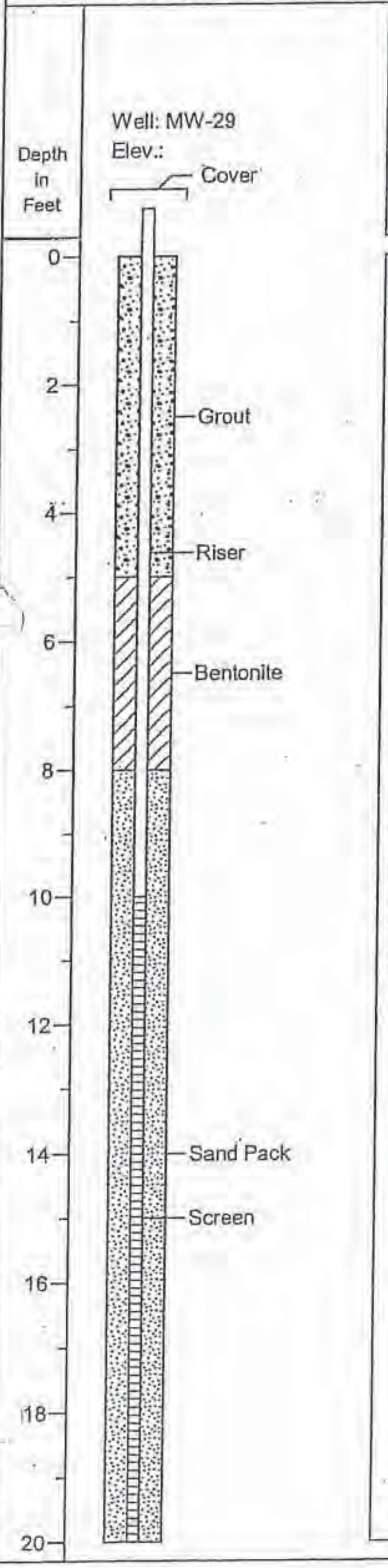
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-25-04/9:30
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-29

(Page 1 of 1)

Date Completed: : 08-25-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	SSI	7	1	biege/light grey with flex of red, very fine grained, SANDY SILT, traces of CLAY, slightly moist, no odor
	CS	2	2	medium grey, fine grained, CLAYEY SAND, very moist to wet, no odor
		4	3	medium grey, fine grained, CLAYEY SAND, traces of GRAVEL, some organic material, very moist, no odor
	S	23	4	light grey/beige, fine to medium grained, SAND, very moist, no odor
				End of Boring = 20'

09-30-2004 F:\LF\SPSA-Regional\Data\Boring Logs\MW-29.bor

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

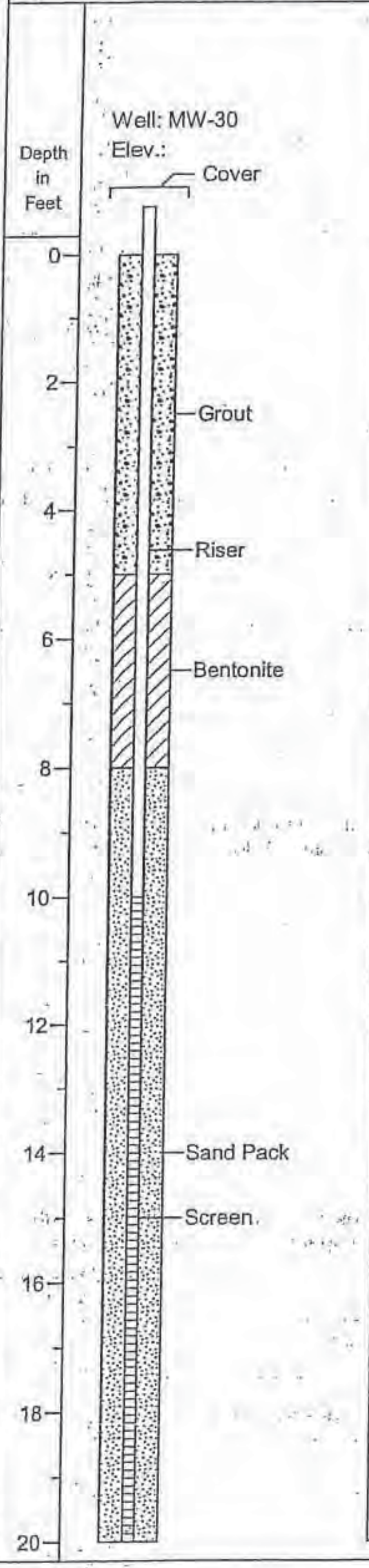
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

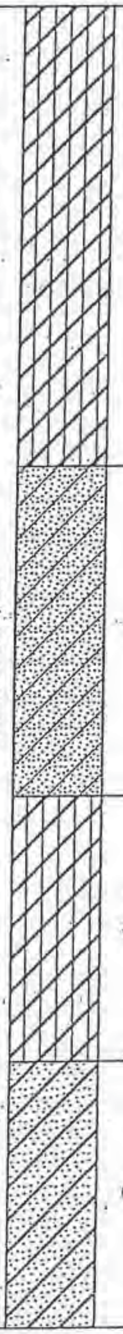
WELL CONSTRUCTION
Date/Time Started : 08-24-04/14:15
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING MW-30

(Page 1 of 1)

Date Completed: : 08-24-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon





Formation	GRAPHIC	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation		CSI	10	1	light grey/beige, CLAYEY SILT, traces of very fine grained sand, slightly moist, no odor
		CS	6	2	light grey/beige with orange, fine grained, CLAYEY SAND, traces of silt, very moist to wet, no odor
		SIC	4	3	dark grey, SILTY CLAY, traces of very fine grained sand, some organic material, moist, no odor
		CS	2	4	medium grey with black flex, fine grained, CLAYEY SAND, very moist to wet, no odor End of Boring = 20'

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

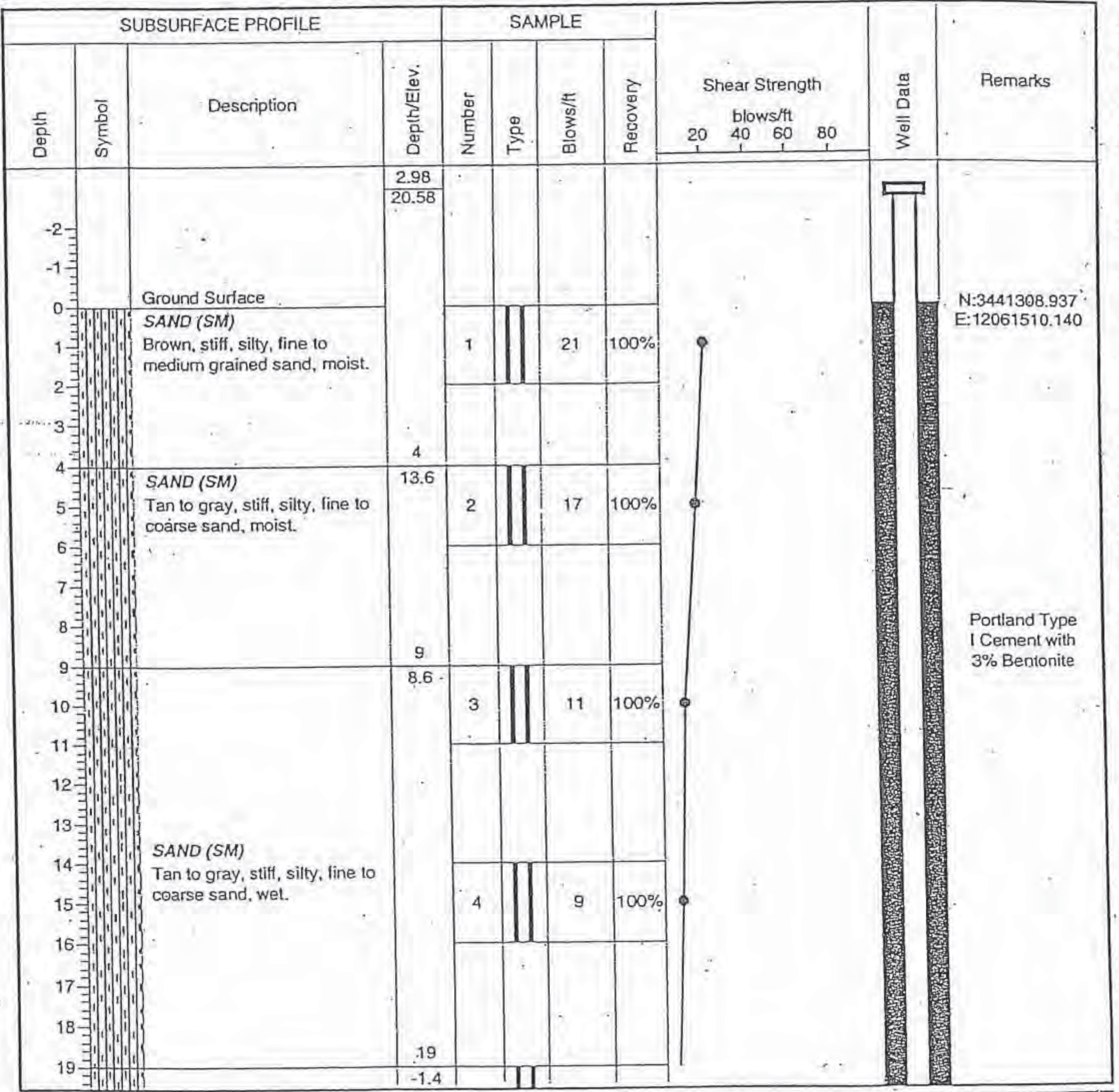
Location: Suffolk, VA

Geologist Log DMW-101

Ground Elevation: 17.6

Geologist: Chris Randazzo

HDR



Depth	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Remarks
		2.98 20.58					
0	Ground Surface						
0–4	*SAND (SM)* Brown, stiff, silty, fine to medium grained sand, moist.	4 13.6	1		21	100%	N:3441308.937 E:12061510.140
4–9	*SAND (SM)* Tan to gray, stiff, silty, fine to coarse sand, moist.	9 8.6	2		17	100%	
9–19	*SAND (SM)* Tan to gray, stiff, silty, fine to coarse sand, wet.	19 -1.4	3		11	100%	Portland Type I Cement with 3% Bentonite
			4		9	100%	

Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: April. 25 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 20.58

Sheet: 1 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

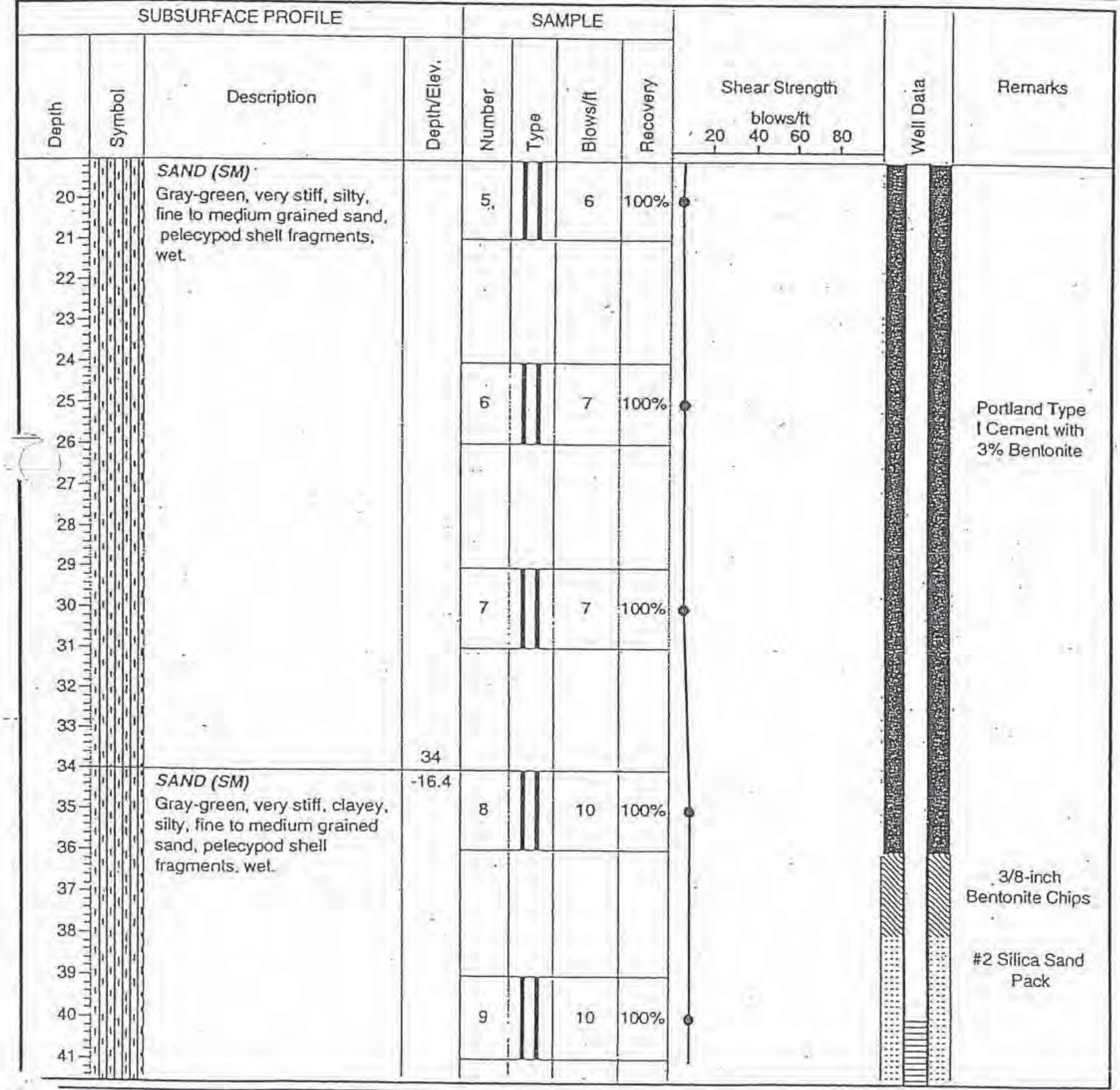
Location: Suffolk, VA

Geologist Log DMW-101

Ground Elevation: 17.6

Geologist: Chris Randazzo

HDR



Depth	Description	Depth/Elev.	Number	Blows/ft	Recovery	Remarks
19–34	***SAND (SM)*** Gray-green, very stiff, silty, fine to medium grained sand, pelecypod shell fragments, wet.					
20			5	6	100%	
25			6	7	100%	Portland Type I Cement with 3% Bentonite
30			7	7	100%	
34–41	***SAND (SM)*** Gray-green, very stiff, clayey, silty, fine to medium grained sand, pelecypod shell fragments, wet.	34 -16.4				
35			8	10	100%	
37						3/8-inch Bentonite Chips
39						#2 Silica Sand Pack
40			9	10	100%	

Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: April, 25 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 20.58

Sheet: 2 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

Location: Suffolk, VA

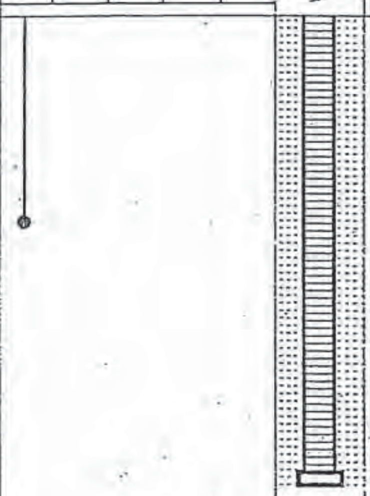
Geologist Log DMW-101

Ground Elevation: 17.6

Geologist: Chris Randazzo

HDR

Depth	Symbol	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60 80	Well Data	Remarks
42–44										
44–51		*SAND (SM)* Gray-green, very stiff, clayey, silty, fine to coarse grained sand, pelecypod shell fragments, wet.	44 -26.4	10		10	100%			2-inch Diameter SCH 40 PVC 0.010-inch Slots
51		End of Borehole	51 -33.4							



Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: April, 25 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 20.58

Sheet: 3 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

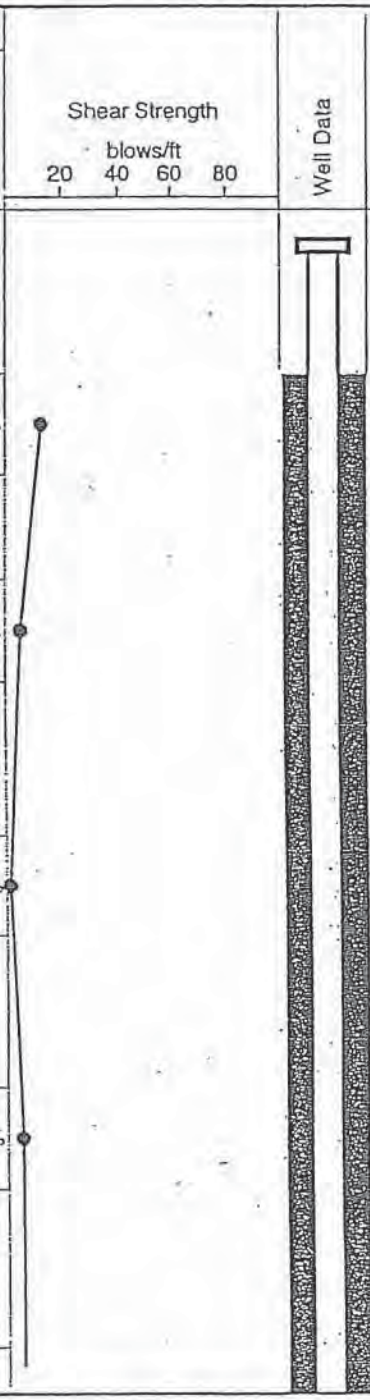
Location: Suffolk, VA

Geologist Log DMW-102

Ground Elevation: 17.2

Geologist: Chris Randazzo

SUBSURFACE PROFILE			SAMPLE				Remarks
Depth	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	
-2		2.66 19.86					
0	Ground Surface						N:3440960.490 E:12062461.458
1			1		13	100%	
4–5	***SAND (SM)*** Tan to dark brown, stiff, silty, medium grained sand, moist.		2		6	100%	
8							Portland Type I Cement with 3% Bentonite
9		9 8.2					
10			3		2	100%	
13–15	***SAND (SM)*** Gray to brown, stiff, silty, medium to fine grained sand, wet.		4		6	100%	
19		19 -1.8					



Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: April. 25 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 19.86

Sheet: 1 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

Location: Suffolk, VA

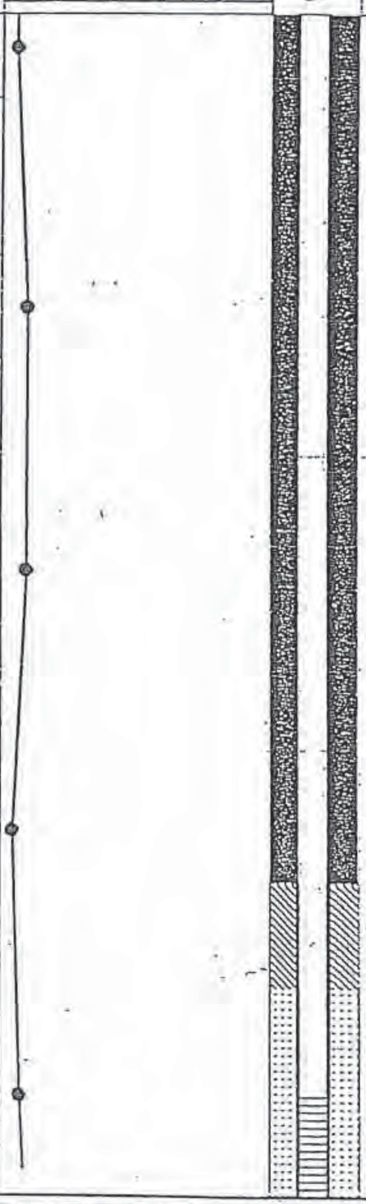
Geologist Log DMW-102

Ground Elevation: 17.2

Geologist: Chris Randazzo

HDR

SUBSURFACE PROFILE				SAMPLE						
Depth	Symbol	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60 80	Well Data	Remarks
20		***SAND (SM)*** Gray-green, very stiff, silty, fine to medium grained sand, pelecypod shell fragments, wet.		5		6	100%			
21										
22										
23										
24										
25				6		10	100%			Portland Type I Cement with 3% Bentonite
26										
27										
28										
29										
30				7		10	100%			
31										
32										
33										
34										
35				8		5	100%			
36										
37										3/8-inch Bentonite Chips
38										
39										#2 Silica Sand Pack
40				9		8	100%			
41										



Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: April, 25 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 19.86

Sheet: 2 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

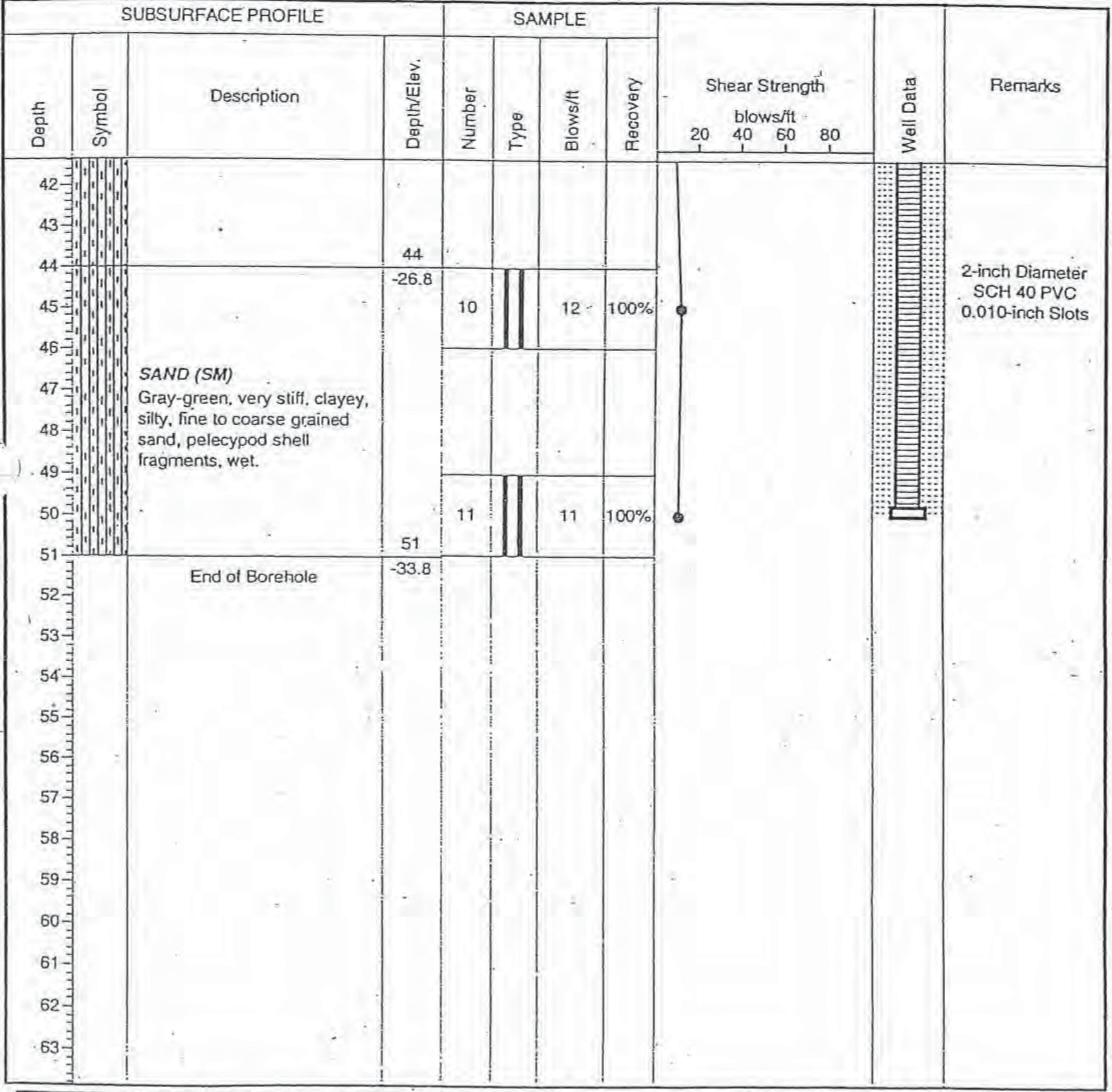
Location: Suffolk, VA

Geologist Log DMW-102

Ground Elevation: 17.2

Geologist: Chris Randazzo

HDR



Depth	Symbol	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60 80	Well Data	Remarks
		SAND (SM) Gray-green, very stiff, clayey, silty, fine to coarse grained sand, pelecypod shell fragments, wet.	44 -26.8	10		12	100%			2-inch Diameter SCH 40 PVC 0.010-inch Slots
				11		11	100%			
		End of Borehole	51 -33.8							

Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: April, 25 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 19.86

Sheet: 3 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

Location: Suffolk, VA

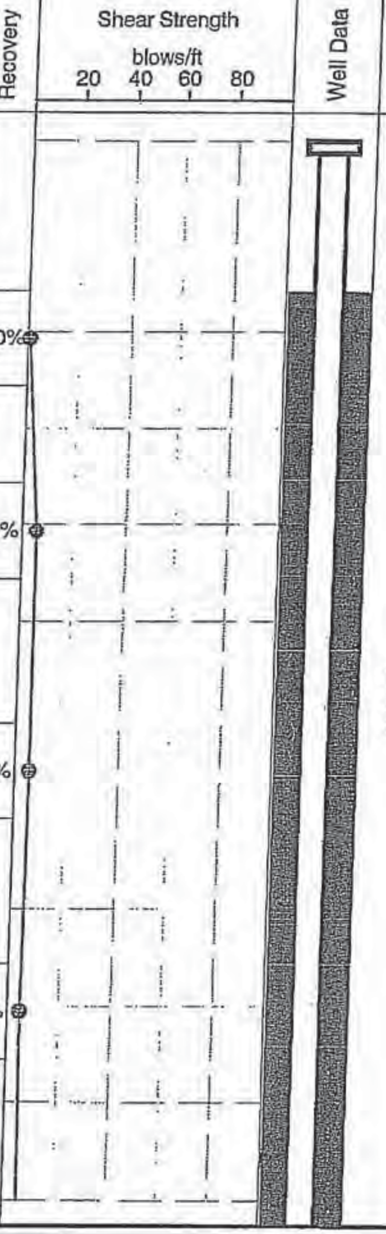
Geologist Log DMW-103

Ground Elevation: 19.7

Geologist: Chris Randazzo

HDR

SUBSURFACE PROFILE				SAMPLE				Remarks
Depth	Symbol	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	
-3			3.14 22 84					
0		Ground Surface						N:3442080.446 E:12061525 348
1				1		1	100%	
5				2		6	100%	
7		*SAND (SM)* Brown-tan, loose, silty fine grained sand pelecypod shell fragments, dry.						Portland Type I Cement with 3% Bentonite
10				3		6	100%	
14		*SAND (SM)* Dark brown-black, loose, silty fine grained sand, dry	14 5 7					
15				4		5	100%	
19			19 0 7					



Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 11, 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 22 84

Sheet: 1 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

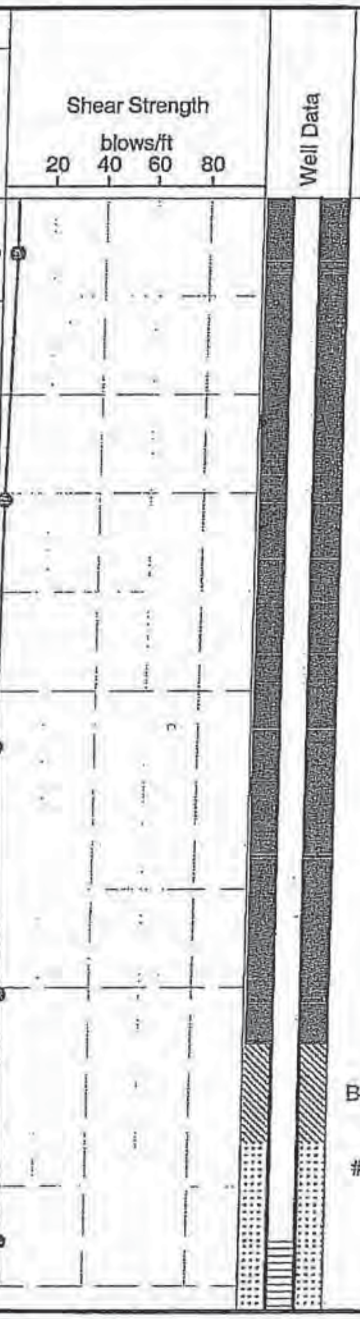
Location: Suffolk, VA

Geologist Log DMW-103

Ground Elevation: 19 7

Geologist: Chris Randazzo

SUBSURFACE PROFILE			SAMPLE				
Depth	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Remarks
19	***SAND (SM)*** Dark brown-black, loose, silty fine grained sand, dry		5		6	100%	
21	***SAND (SM)*** Tan, gray, and dark brown, loose, silty fine to coarse grained sand, small amount of clay mottling, moist	24					
24	***SAND (SM)*** Gray and tan, loose, silty medium to coarse grained sand, small amount of stiff clay mottling, pelecypod shell fragments, wet.	-4 3	6		3	100%	Portland Type I Cement with 3% Bentonite
29		34	7		2	100%	
34	***SAND (SM)*** Gray and tan, loose, silty medium to coarse grained sand, small amount of stiff brown clay mottling, pelecypod shell fragments, wet.	-14.3	8		5	100%	3/8-inch Bentonite Chips
39			9		7	100%	#2 Silica Sand Pack



Drilled by: Fishburne Drilling Inc

Drill Method: Hollow Stem Auger

Drill Date: May 11, 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 22 84

Sheet: 2 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

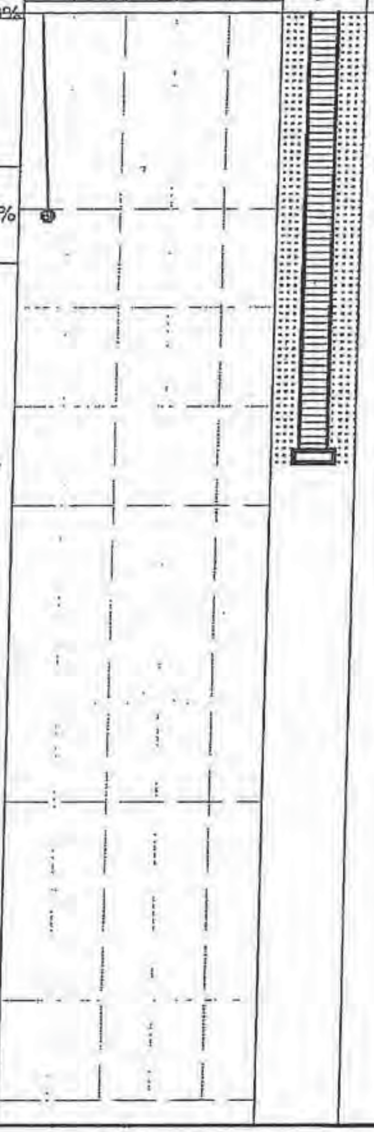
Location: Suffolk, VA

Geologist Log DMW-103

Ground Elevation: 19.7

Geologist: Chris Randazzo

SUBSURFACE PROFILE				SAMPLE						
Depth	Symbol	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Shear Strength blows/ft 20 40 60 80	Well Data	Remarks
44		***SAND (SM)*** [Top 1'] Light gray, loose, coarse sand, wet. [Bottom 1'] Gray-green, firm, silty fine grained sand, small amount of clay, pelecypod shell fragments, wet.	44 -24.3	10		12	100%			2-inch Diameter SCH 40 PVC 0.010-inch Slots
49		***SAND (SM)*** Gray-green, firm, silty fine grained sand, small amount of clay, pelecypod shell fragments, wet.	49 -29.3							
51		End of Borehole	51 -31.3							



Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 11, 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 22.84

Sheet: 3 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

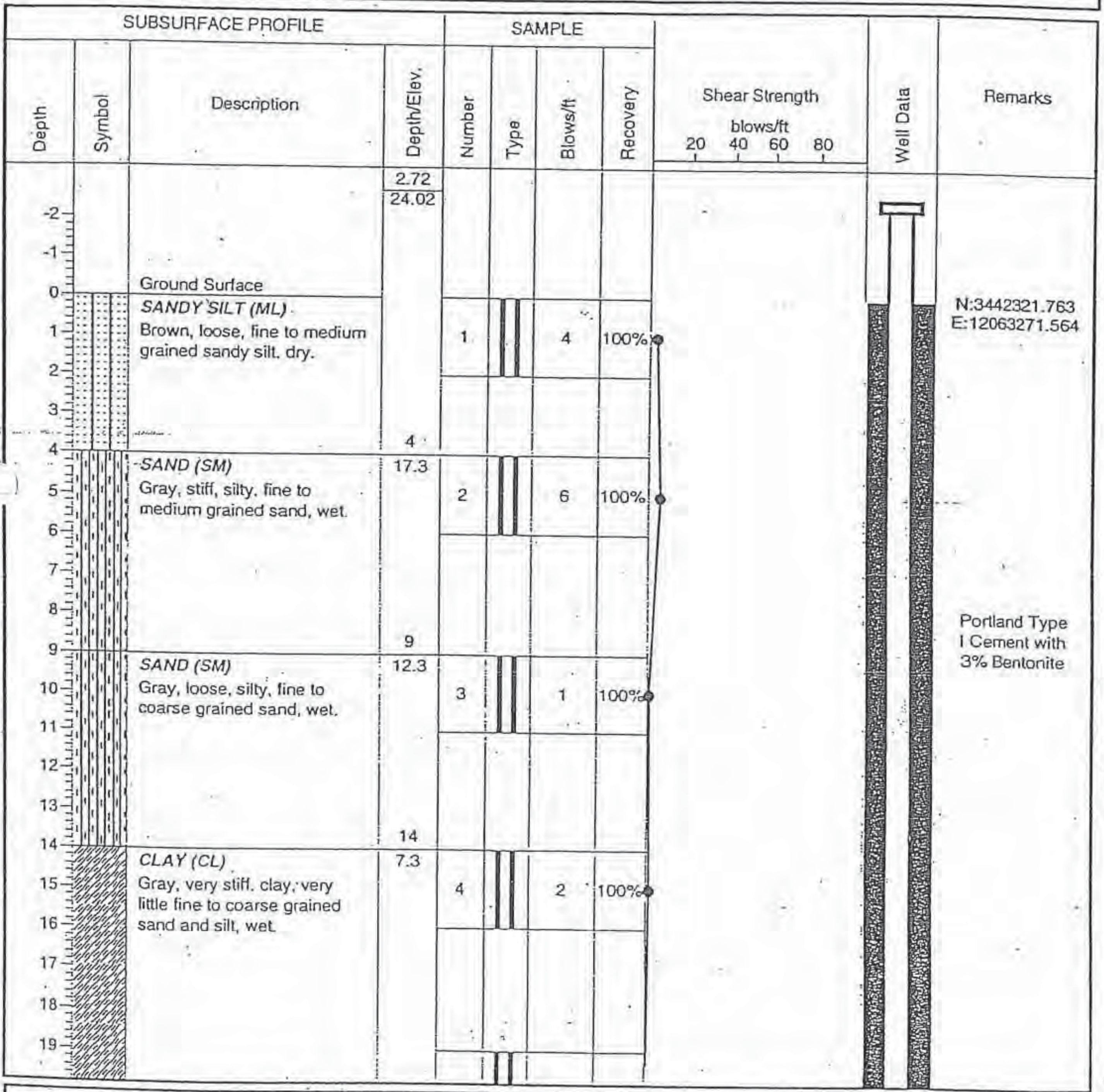
Client: SPSA

Location: Suffolk, VA

Geologist Log DMW-104

Ground Elevation: 21.3

Geologist: Chris Randazzo



Depth	Description	Depth/Elev.	Number	Type	Blows/ft	Recovery	Remarks
		2.72 24.02					
0	Ground Surface						
0–4	*SANDY SILT (ML)* Brown, loose, fine to medium grained sandy silt, dry.	4	1		4	100%	N:3442321.763 E:12063271.564
4–9	*SAND (SM)* Gray, stiff, silty, fine to medium grained sand, wet.	17.3 9	2		6	100%	
9–14	*SAND (SM)* Gray, loose, silty, fine to coarse grained sand, wet.	12.3 14	3		1	100%	Portland Type I Cement with 3% Bentonite
14–	*CLAY (CL)* Gray, very stiff, clay, very little fine to coarse grained sand and silt, wet.	7.3	4		2	100%	

Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 11, 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 24.02

Sheet: 1 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

Client: SPSA

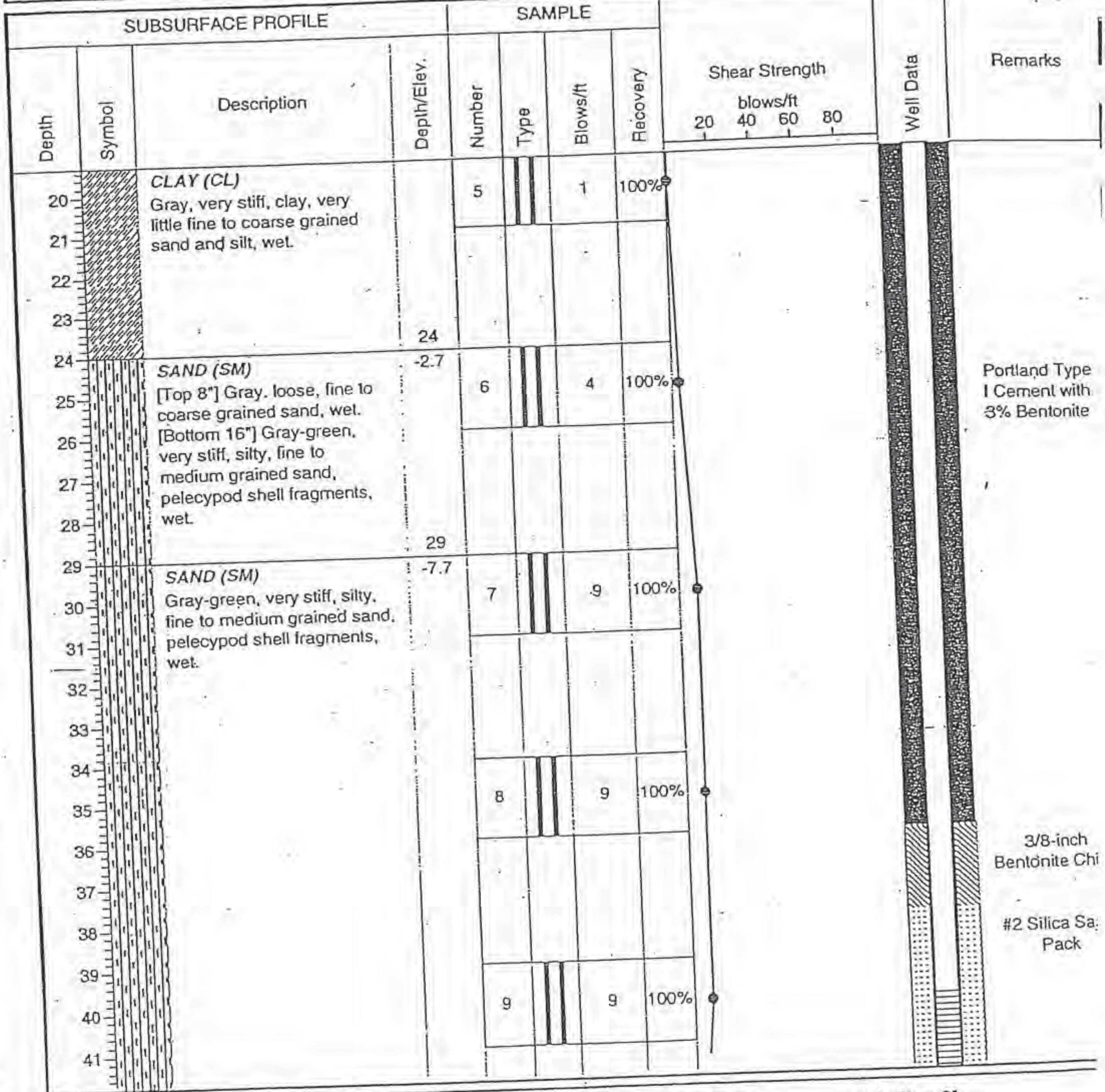
Location: Suffolk, VA

Geologist Log DMW-104

Ground Elevation: 21.3

Geologist: Chris Randazzo

HDR



Depth	Description	Depth/Elev.
20–24	*CLAY (CL)* Gray, very stiff, clay, very little fine to coarse grained sand and silt, wet.	24 -2.7
24–29	*SAND (SM)* [Top 8"] Gray, loose, fine to coarse grained sand, wet. [Bottom 16"] Gray-green, very stiff, silty, fine to medium grained sand, pelecypod shell fragments, wet.	29 -7.7
29–41	*SAND (SM)* Gray-green, very stiff, silty, fine to medium grained sand, pelecypod shell fragments, wet.	

Number	Blows/ft	Recovery
5	1	100%
6	4	100%
7	9	100%
8	9	100%
9	9	100%

Remarks:

Portland Type I Cement with 3% Bentonite

3/8-inch Bentonite Chi

#2 Silica Sa Pack

Drilled by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 11, 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 24.02

Sheet: 2 of 3

Project No: 01743-077-018-20

Project: SPSA Regional Landfill

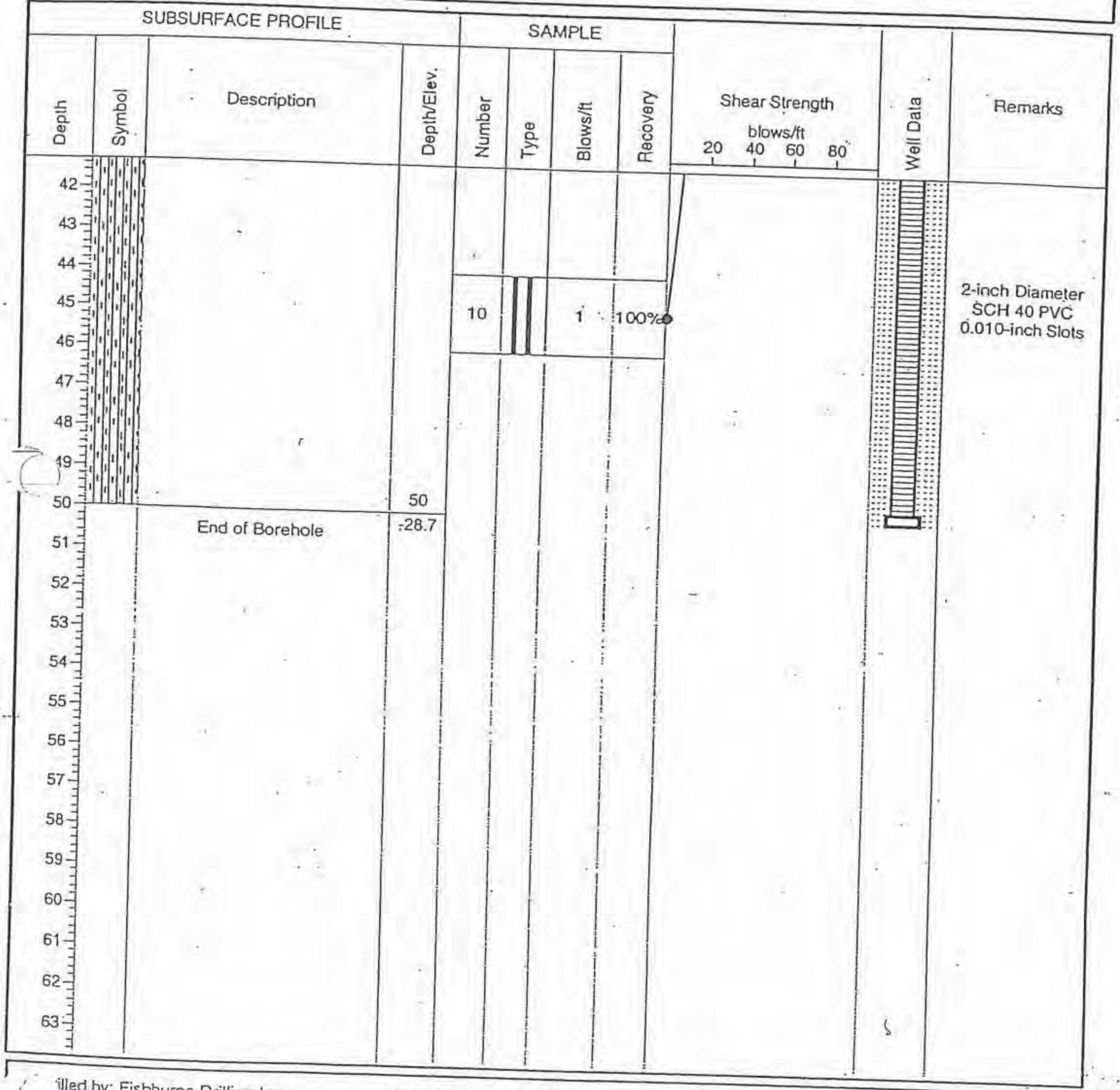
Client: SPSA

Location: Suffolk, VA

Geologist Log DMW-104

Ground Elevation: 21.3

Geologist: Chris Randazzo



End of Borehole

2-inch Diameter
SCH 40 PVC
0.010-inch Slots

illed by: Fishburne Drilling Inc.

Drill Method: Hollow Stem Auger

Drill Date: May 11, 2000

HDR Engineering, Inc. of the Carolinas
128 S. Tryon Street
Suite 1400
Charlotte, NC. 28202

Hole Size: 6"

Top-of-Casing: 24.02

Sheet: 3 of 3

SCS ENGINEERS
Environmental Consultants
107 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

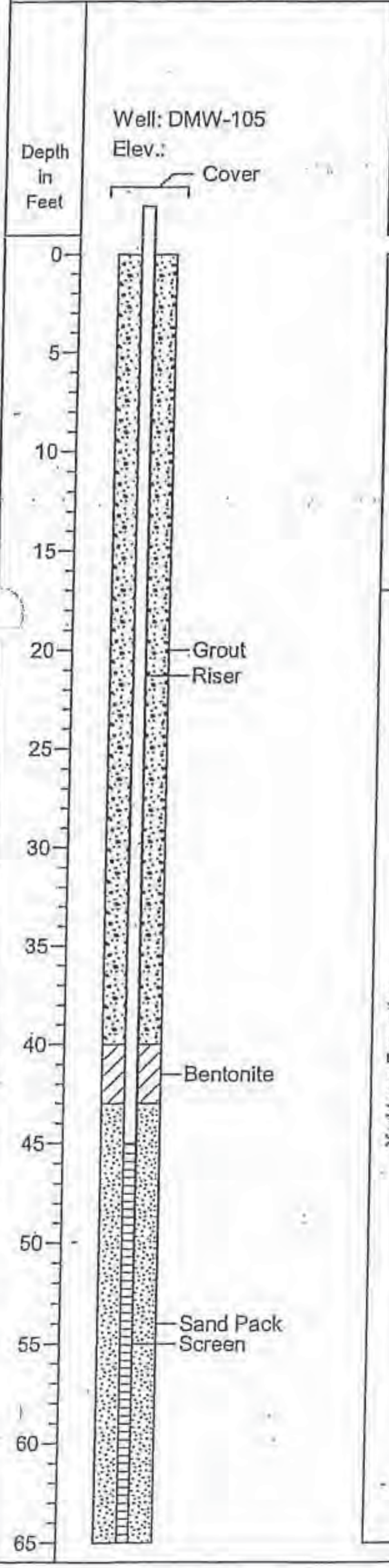
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-25-04/14:45
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING DMW-105

(Page 1 of 1)

Date Completed: : 08-26-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	S	18	1	light brown/light grey, fine grained, SAND, traces of SILT, very moist, no odor
		14	2	biege/light grey with black flex, fine to medium grained, SAND, very moist to wet, no odor
	SC	12	3	medium gray, fine grained, SANDY CLAY, traces of SILT, some organic material, moist, no odor
Yorktown Formation	SIC	13	4	greenish grey, SILTY CLAY, traces of very fine grained SAND, slightly moist, no odor
		7	5	same as above
		7	6	greenish grey, SILTY CLAY, traces of very fine grained SAND, weathered white shell fragements, slightly moist, no odor
		9	7	same as above
		16	8	same as above
		11	9	same as above
		19	10	greenish grey, SILTY CLAY, traces of very fine grained SAND, high amount of weathered white shell fragements, slightly moist, no odor
	CS	7	11	greenish grey with black flex, fine to medium grained, CLAYEY SAND, weathered white shell fragments, wet, no odor
	CSI	15	12	greenish grey with black flex, CLAYEY SILT, traces of very fine grained sand, very moist to wet, no odor
		13	13	greenish grey with black flex, CLAYEY SILT, traces of very fine grained sand, moist, no odor End of Boring = 65'

SCS ENGINEERS
Environmental Consultants
407 South Loudoun Street
Winchester, Virginia 22601
540 662-7097 FAX 540 662-8468

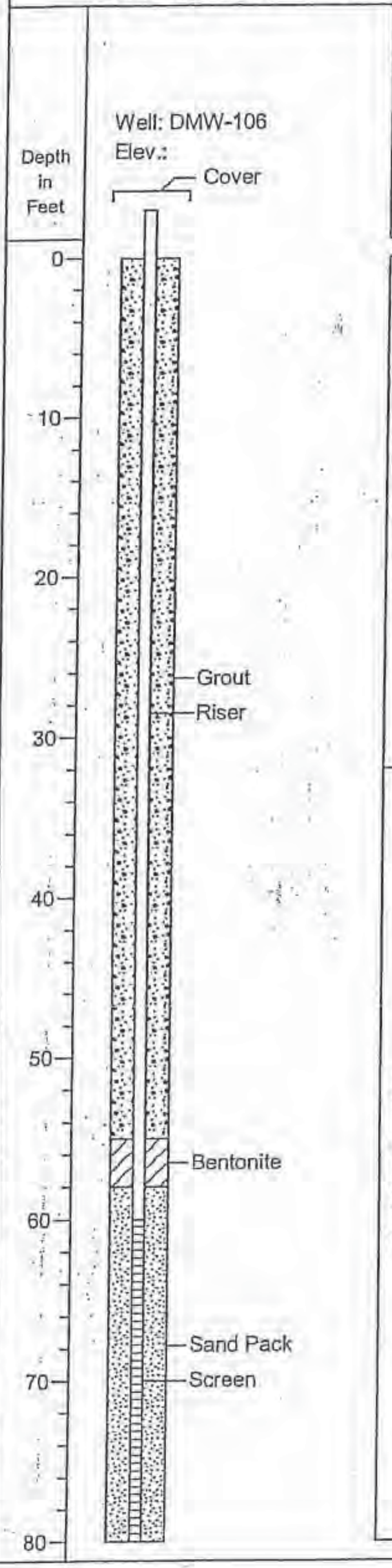
Client: Southeastern Public Service Authority (SPSA)
Facility Name: SPSA Regional Sanitary Landfill
Location: Suffolk, VA
SCS Job No. 02201028.40

WELL CONSTRUCTION
Date/Time Started : 08-26-04/13:45
Hole Diameter : 8"
Drilling Method : HSA (4.25" ID, 8" OD)
WELL CASING
Material : Sch. 40 PVC
Diameter : 2" ID
Joints : threaded
Opening : 0.010" slot
Sand Pack : #2 quartz

LOG OF BORING DMW-106

(Page 1 of 1)

Date Completed: : 08-27-04
Logged By: : Jennifer Trigg
Checked By: : Brad Blase
Drilling Company: : Fishburne Drilling
Sampling Method: : 2" Split Spoon



Formation	USCS	Blow Count	Sample	DESCRIPTION
Columbia Formation	SSI	7	1	biege/light grey with flex of red, very fine grained, SANDY SILT, traces of CLAY, slightly moist, no odor
	CS	2	2	medium grey, fine grained, CLAYEY SAND, very moist to wet, no odor
		4	3	medium grey, fine grained, CLAYEY SAND, traces of GRAVEL, some organic material, very moist, no odor
	S	23	4	light grey/beige, fine to medium grained, SAND, very moist, no odor
		7	5	light grey/beige, fine grained, SAND, some organic material, very moist, no odor
		20	6	light grey/beige, fine to medium grained, SAND, some organic material, very moist, no odor
Yorktown Formation	SIC	7	7	greenish grey, SILTY CLAY, traces of very fine grained SAND, slightly moist, no odor
		12	8	greenish grey, SILTY CLAY, traces of very fine grained SAND, some weathered white shell fragments, slightly moist, no odor
		5	9	same as above
		8	10	same as above
		12	11	same as above
		11	12	same as above
		10	13	same as above
		11	14	greenish grey with some black flex, SILTY CLAY, traces of very fine grained SAND, weathered white shell fragments, moist, no odor
	SIC	11	15	mostly wheathered white shell fragments, greenish grey with black flex, SILTY CLAY, very moist, no odor
	CSI	16	16	greenish grey with black and white flex, CLAYEY SILT, traces of very fine grained SAND, slightly moist, no odor End of Boring = 80'

APPENDIX D

TABLE 5.1 PARAMETERS

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TABLE 5.5 PARAMETERS

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Table 5.5 Parameters						
Parameter	**SW-846 Method**	**Sample Size - Container**	**Maximum Holding Time**	**Preservation**	**LOD (ug/L)**	**LOQ (ug/L)**
Priority Pollutant Metals						
Antimony	7041	500 mL - plastic	6 months	HNO_3 to pH <2	1	5
Arsenic	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	3	10
Barium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Beryllium	7091	500 mL - plastic	6 months	HNO_3 to pH <2	0.1	0.5
Cadmium	7131A	500 mL - plastic	6 months	HNO_3 to pH <2	0.1	0.5
Chromium (III)	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	1	10
Cobalt	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Copper	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	3	5
Lead	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	6	10
Nickel	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Selenium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Silver	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Thallium	7841	500 mL - plastic	6 months	HNO_3 to pH <2	2	2
Vanadium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Zinc	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	10	20
Volatile Organic Compounds						
1,2-Dibromo-3-chloropropane	8011	60 mL (2) - Amber VOA	14 days	4°C; 6 drops conc. HCl; No head space	0.010	0.01
1,2-Dibromoethane	8011	60 mL (2) - Amber VOA	14 days	4°C; 6 drops conc. HCl; No head space	0.008	0.01
1,1,1,2-Tetrachloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
1,1,1-Trichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1,2,2-Tetrachloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
1,1,2-Trichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1-Dichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,2,3-Trichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,2-Dichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,2-Dichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
2-Hexanone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10

Table 5.5 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
4-Methyl-2-pentanone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.2	10
Acetone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	7.0	10
Acrylonitrile	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10
Benzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Bromochloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.4	1.0
Bromodichloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Bromoform	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
Carbon Disulfide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.2	10
Carbon Tetrachloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Chlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
Chloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Chloroform	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
cis-1,2-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
cis-1,3-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Dibromochloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Ethylbenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
Methyl bromide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Methyl chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
Methyl ethyl ketone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10
Methyl iodide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10
Methylene bromide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
Methylene chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
1,2-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
1,4-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
Styrene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
Tetrachloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Toluene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0

Table 5.5 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
trans-1,2-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
trans-1,3-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
trans-1,4-Dichloro-2-butene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.1	4.0
Trichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Trichlorofluoromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Vinyl acetate	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	2.2	10
Vinyl chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Xylenes	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	3.0

LOD = Limit of Detection
LOQ = Limit of Quantitation

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Herbicides						
2,4,5-T	8151A	1 L - Glass Amber	7/40 days after extraction	4°C	0.10	0.4
2,4,5-TP (Silvex)	8151A	1 L - Glass Amber	7/40 days after extraction	4°C	0.10	0.34
2,4-D	8151A	1 L - Glass Amber	7/40 days after extraction	4°C	0.10	0.25
Dinoseb	8151A	1 L - Glass Amber	7/40 days after extraction	4°C	0.10	0.4
Pentachlorophenol	8151A	1 L - Glass Amber	7/40 days after extraction	4°C	0.10	1.0
Inorganics						
Cyanide	9010	250 mL - plastic	14/24 hours if sulfide is present	NaOH to pH >12; 4°C in the dark	20	20
Sulfide	9030	250 mL - plastic	7 days	4°C, add 4 drops 2 N zinc acetate per 100 mL; NaOH to pH >9	1000	1000
Priority Pollutant Metals						
Antimony	7041	500 mL - plastic	6 months	HNO_3 to pH <2	1	5
Arsenic	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	3	10
Barium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Beryllium	7091	500 mL - plastic	6 months	HNO_3 to pH <2	0.1	0.5
Cadmium	7131A	500 mL - plastic	6 months	HNO_3 to pH <2	0.1	0.5
Chromium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	1	10
Cobalt	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Copper	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	3	5
Lead	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	6	10
Mercury	7470A	500 mL - plastic	6 months	HNO_3 to pH <2	0.2	0.2
Nickel	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Selenium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Silver	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Thallium	7841	500 mL - plastic	6 months	HNO_3 to pH <2	2	2
Tin	7871	500 mL - plastic	6 months	HNO_3 to pH <2	2	20

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Vanadium	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	2	10
Zinc	6010B	500 mL - plastic	6 months	HNO_3 to pH <2	10	20
Pesticides and PCBs						
4,4 -DDD	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.1
4,4 -DDE	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.04
4,4 -DDT	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.12
Aldrin	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.02
alpha-BHC	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.02
beta-BHC	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.05
Chlordane	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.10	1.0
delta-BHC	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.012	0.05
Dieldrin	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.02
Endosulfan I	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.1
Endosulfan II	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.04
Endosulfan sulfate	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.5
Endrin	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.1
Endrin aldehyde	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.010	0.2
gamma-BHC (Lindane)	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.02

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Heptachlor	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.05
Heptachlor epoxide	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.005	0.2
Methoxychlor	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.010	2.0
PCB-1016	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
PCB-1221	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
PCB-1232	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
PCB-1242	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
PCB-1248	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
PCB-1254	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
PCB-1260	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.2	5.0
Toxaphene	8081A / 8082	1 L - Glass Amber	7/40 days after extraction	4°C	0.25	3.0
Semi-Volatile Organic Compounds						
1,2,4,5-Tetrachlorobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
1,4-Naphthoquinone	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
1-Naphthylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,3,4,6-Tetrachlorophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,4,5-Trichlorophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
2,4,6-Trichlorophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,4-Dichlorophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,4-Dimethylphenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,4-Dinitrophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,4-Dinitrotoluene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
2,6-Dichlorophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2,6-Dinitrotoluene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
2-Acetylaminofluorene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2-Chloronaphthalene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
2-Chlorophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
2-Methylnaphthalene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
2-Naphthylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
3,3 -Dichlorobenzidine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	4.0	10
3,3 -Dimethylbenzidine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
3-Methylcholanthrene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
4,6-Dinitro-o-cresol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
4-Aminobiphenyl	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
4-Bromophenyl phenyl ether	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
4-Chloro-3-methylphenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
4-Chlorophenyl phenyl ether	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
5-Nitro-o-toluidene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
7,12-Dimethylbenz[a]anthracene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Acenaphthene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Acenaphthylene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Acetophenone	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Anthracene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Benzo[a]anthracene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Benzo[a]pyrene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Benzo[b]fluoranthene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Benzo[ghi]perylene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Benzo[k]fluoranthene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Benzyl alcohol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Bis(2-chloro-1-methylethyl)ether	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Bis(2-chloroethoxy)methane	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Bis(2-chloroethyl)ether	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Bis(2-ethylhexyl)phthalate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Butyl benzyl phthalate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Chlorobenzilate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Chrysene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Diallate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Dibenz[a,h]anthracene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Dibenzofuran	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Diethyl phthalate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Dimethoate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	20
Dimethyl phthalate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Di-n-butyl phthalate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Di-n-octyl phthalate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Diphenylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	5.0
Disulfoton	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Ethyl methane sulfonate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Famphur	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	20

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Fluoranthene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Fluorene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Hexachlorobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Hexachlorobutadiene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Hexachlorocyclopentadiene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Hexachloroethane	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Hexachloropropene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Indeno[1,2,3-cd]pyrene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Isodrin	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Isophorone	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Isosafrole	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Kepone	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	20
m,p-Cresol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
m-Dinitrobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	5.0	20
Methapyrilene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Methyl methane sulfonate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Methyl parathion	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
m-Nitroaniline	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Nitrobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
N-Nitrosodiethylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	7.0	20
N-Nitrosodimethylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
N-Nitrosodi-n-butylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
N-Nitrosodiphenylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	5.0
N-Nitrosodipropylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	5.0
N-Nitrosomethylethylamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	5.0
N-Nitrosopiperidine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
N-Nitrosopyrrolidine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	5.0
O,O,O-Triethyl phosphorothioate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
O,O-Diethyl O-2pyrazinyl phosphorothioate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	20
o-Cresol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
o-Nitroaniline	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
o-Nitrophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
o-Toluidine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	5.0
p-(Dimethylamino)azobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	20

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Parathion	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
p-Chloroaniline	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Pentachlorobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Pentachloronitrobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Phenacitin	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Phenanthrene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Phenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
Phorate	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
p-Nitroaniline	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
p-Nitrophenol	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	10
p-Phenylenediamine	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Pronamide	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
Pyrene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Safrole	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	2.0	10
sym-Trinitrobenzene	8270C	1 L - Glass Amber	7/40 days after extraction	4°C	1.0	5.0
Volatile Organic Compounds						
1,2-Dibromo-3-chloropropane	8011	60 mL (2) - Amber VOA	14 days	4°C; 6 drops conc. HCl; No head space	0.010	0.01

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
1,2-Dibromoethane	8011	60 mL (2) - Amber VOA	14 days	4°C; 6 drops conc. HCl; No head space	0.008	0.01
1,1,1,2-Tetrachloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
1,1,1-Trichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1,2,2-Tetrachloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
1,1,2-Trichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1-Dichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,1-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,2,3-Trichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,2,4-Trichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
1,2-Dichloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
1,2-Dichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
1,3-Dichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
2,2-Dichloropropane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	2.0
2-Hexanone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
4-Methyl-2-pentanone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.2	10
Acetone	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	7.0	10
Acetonitrile	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	5.9	40
Acrolein	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	5.1	10
Acrylonitrile	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.7	10
Allyl Chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.6	4.0
Benzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Bromochloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.4	1.0
Bromodichloromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Bromoform	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
Carbon Disulfide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.2	10
Carbon Tetrachloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Chlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
Chloroethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Chloroform	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Chloroprene	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.8	5.0
cis-1,2-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	0.5
cis-1,3-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	1.0
Dibromochloromethane	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	1.0
Dichlorodifluoromethane	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	1.0
Ethyl methacrylate	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.5	5.0
Ethylbenzene	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.1	1.0
Isobutyl alcohol	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	18	40
m-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	0.5
Methacrylonitrile	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.6	20
Methyl bromide	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	1.0
Methyl chloride	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.3	1.0
Methyl ethyl ketone	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	1.7	10
Methyl iodide	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	1.7	10
Methyl methacrylate	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.6	4.0

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Methylene bromide	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
Methylene chloride	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
Naphthalene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.3	1.0
o-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
p-Dichlorobenzene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
Propionitrile	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	7.5	40
Styrene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.1	1.0
Tetrachloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Toluene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
trans-1,2-Dichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	0.5
trans-1,3-Dichloropropene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
trans-1,4-Dichloro-2-butene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	1.1	4.0
Trichloroethene	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Trichlorofluoromethane	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	0.2	1.0
Vinyl acetate	8260B	40 mL (3) - glass VOA	14 days	4°C; 4 drops conc. HCl; No head space	2.2	10

Table 5.1 Parameters

Parameter	SW-846 Method	Sample Size - Container	Maximum Holding Time	Preservation	LOD (ug/L)	LOQ (ug/L)
Vinyl chloride	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.2	1.0
Xylenes	8260B	40 mL (3) - glass VOA	14 days	4^{o}C; 4 drops conc. HCl; No head space	0.3	3.0

LOD = Limit of Detection
LOQ = Limit of Quantitation

APPENDIX E

GROUNDWATER PROTECTION STANDARDS

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Variance to the Virginia Solid Waste Management Regulations
Use of Alternate Concentration Limits as Groundwater Protection Standards

In response to a Petition for Variance, submitted by SPSA for their landfill, Permit 417, as allowed under 9 VAC 20-80-760.A, the Department hereby grants approval to a Variance from Virginia Solid Waste Management Regulations [9 VAC 20-80-300.B.3] limited to the conditions outlined below:

1] The Variance approval is for the use of Alternate Concentration Limits (ACLs) as groundwater protection standards for the constituents listed below which lack background data, or a USEPA Maximum Concentration Level (MCL):

1) Acenaphthene, 2) Acenaphthylene, 3) Acetone, 4) Acetonitrile / Methyl cyanide, 5) Acetophenone, 6) 2-Acetylaminofluorene / 2-AAF, 7) Acrolein, 8) Acrylonitrile, 9) Aldrin, 10) Allyl chloride 11) 4-Aminobiphenyl, 12) Anthracene, 13) Benzo[a]anthracene, 14) Benzo[b]fluoranthene 15) Benzo[k]flouranthene, 16) Benzo[ghi]perylene, 17) Benzyl alcohol, 18) BHC-alpha 19) BHC-beta, 20) BHC-delta, 21) Bis(2-chlorethoxy)methane, 22) Bis(2-chloroethyl)ether / Dichloroethyl ether, 23) Bis(2-chloro-1-methylethyl)ether / 2,2-Dichlorodiisopropyl ether, 24) Bis(2-ethylhexyl)phthalate, 25) Bromochloromethane / Chlorobromomethane, 26) 4-Bromophenyl phenyl ether 27) Butyl benzl phthalate / Benzyl butyl phthalate, 28) Carbon disulfide, 29) p-Chloroaniline / 4-Chloroaniline, 30) Chlorobenzilate, 31) p-Chloro-m-cresol / 4-Chloro-3-methylphenol, 32) Chloroethane / Ethyl chloride, 33) 2-Chloronaphthalene, 34) 2-Chlorophenol, 35) 4-Chlorophenyl phenyl ether, 36) Chloroprene, 37) Chrysene, 38) Cobalt, 39) Copper, 40) m-Cresol / 3-Methylphenol, 41) o-Cresol / 2-Methylphenol, 42) p-Cresol / 4-Methylphenol, 43) 4, 4-DDD, 44) 4,4-DDE, 45) 4,4-DDT, 46) Diallate, 47) Dibenz[a,h]anthracene, 48) Dibenzofuran, 49) Di-n-butyl phthalate, 50) m-Dichlorobenzene / 1,3-Dichlorobenzene, 51) 3,3-Dichlorobenzidine, 52) Trans-1,4-Dichloro-2-butene, 53) Dichlorodifluoromethane / CFC-12, 54) 1,1-Dichloroethane / Ethylidene chloride, 55) 2,4-Dichlorophenol, 56) 2,6-Dichlorophenol, 57) 1,3-Dichloropropane / Trimethylene dichloride, 58) 2,2-Dichloropropane / Isopropylidene chloride 59) 1,1-Dichloropropene, 60) Cis-1,3-Dichloropropene, 61) Trans-1,3-Dichloropropene, 62) Dieldrin, 63) Diethyl phthalate, 64) 0,0-Diethyl 0-2-pyrazinyl phosphorothioate / Thionazin, 65) Dimethoate, 66) p-(Dimethylamino)azobenzene / Azobenzene, 67) 7,12-Dimethylbenzidine[a]anthracene, 68) 3,3-Dimethylbenzidine, 69) 2,4-Dimethylphenol / m-Xyenol, 70) Dimethyl phthalate, 71) m-Dinitrobenzene, 72) 4,6-Dinitro-o-cresol / 4,6-Dinitro-2-methylphenol, 73) 2,4-Dinitrophenol, 74) 2,4-Dinitrotoluene, 75) 2,6-Dinitrotoluene, 76) Di-n-octyl phthalate, 77) Diphenylamine, 78) Disulfoton, 79) Endosulfan I, 80) Endosulfan II, 81) Endosulfan sulfate, 82) Endrin aldehyde, 83) Ethyl methacrylate, 84) Ethyl methanesulfonate, 85) Famphur, 86) Flouranthene, 87) Fluorene, 88) Hexachlorobutadiene, 89) Hexachloroethane, 90) Hexachloropropene, 91) 2-Hexanone / Methyl butyl ketone, 92) Isobutyl alcohol / Isobutanol, 93) Isodrin, 94) Isophrone, 95) Isosafrole, 96) Kepone, 98) Methacrylonitrile, 99) Methapyrilene, 100) Methyl bromide / Bromomethane, 101) Methyl Chloride / Chloromethane, 102) 3-Methylcholanthrene, 103) Methyl Ethyl Ketone / MEK / 2-Butanone, 104) Methyl iodide / Iodomethane, 105) Methyl methacrylate, 106) Methyl methanesulfonate, 107) 2 Methylnaphthalene, 108) Methyl parathion / Parathion methyl, 109) 4-Methyl-2-pentanone / Methyl isobutyl ketone, 110) Methylene bromide, 111) Naphthalene 112) 1,4-Naphthoquinone, 113) 1-Naphthylamine, 114) 2-Naphthylamine, 115) Nickel 116) o-Nitroaniline / 2-Nitroaniline, 117) m-Nitroaniline / 3-Nitroaniline, 118) p-Nitroaniline / 4-Nitroaniline, 119) Nitrobenzene, 120) o-Nitrophenol / 2-Nitrophenol, 121) p-Nitrophenol / 4-Nitrophenol, 122) N-Nitrosodi-n-butylamine, 123) N-Nitrosodiethylamine, 124) N-Nitrosodimethylamine, 125) N-Nitrosodiphenylamine, 126) N-Nitrosodipropylamine / Di-n-propylnitrosamine, 127) N-Nitrosomethylethylamine, 128) N-Nitrosopiperidine, 129) N-Nitrosopyrrolidine, 130) 5-Nitro-o-toludidine, 131) Parathion, 132) Pentachlorobenzene, 133) Pentachloronitobenzene, 134) Phenacetin, 135) Phenanthrene, 136) Phenol, 137) p-Phenylenediamine, 138) Phorate, 139) Pronamide, 140) Propionitrile / Ethyl cyanide, 141) Pyrene, 142) Safrole, 143) Silver, 145) 1,2,4,5-Tetrachlorobenzene, 146) 1,1,1,2-Tetrachloroethane, 147) 1,1,2,2-Tetrachloroethane, 148) 2,3,4,6-Tetrachlorophenol, 149) Tin, 150) o-Toluidine / 2-Methylaniline, 151) Trichlorofluoromethane / CFC-11, 152) 2,4,5-Trichlorophenol, 153) 2,4,6-Trichlorophenol, 154) 2,4,5-Trichloro-phenoxyacetic acid, 155) 1,2,3-Trichloropropane, 156) O,O,O-Triethyl phosphorothioate, 157) (syn) 1,3,5-Trinitrobenzene, 159) Vinyl acetate, 160) Zinc

Groundwater Protection Standards with ACL's
Facility Name: SPSA Landfill, #417

Constituent (CAS RN)		*Concentration*		*Source*
Acenaphthene	83-32-9	134	µg/l	ACL
Acenaphthylene	208-96-8	(0)*	µg/l	ACL
Acetone	67-64-1	2012	µg/l	ACL
Acetonitrile	75-05-8	38	µg/l	ACL
Acetophenone	98-86-2	224	µg/l	ACL
2-Acetylaminofluorene / 2-AAF	53-96-3	(0)*	µg/l	ACL
Acrolein	107-02-8	0.015	µg/l	ACL
Acrylonitrile	107-13-1	0.037	µg/l	ACL
Aldrin	309-00-2	0.004	µg/l	ACL
Allyl chloride	107-05-1	4.54	µg/l	ACL
4-Aminobiphenyl	92-67-1	(0)*	µg/l	ACL
Anthracene	120-12-7	671	µg/l	ACL
Antimony	**---**	**11**	**µg/l**	**BKG**
Arsenic	**---**	**16**	**µg/l**	**BKG**
Barium	**---**	**2,000**	**µg/l**	**MCL**
Benzene	**71-43-2**	**5**	**µg/l**	**MCL**
Benzo[a]anthracene	56-55-3	0.092	µg/l	ACL
Benzo[b]fluoranthene	205-99-2	0.092	µg/l	ACL
Benzo[k]fluoranthene	207-08-9	0.917	µg/l	ACL
Benzo[ghi]perylene	191-24-2	(0)*	µg/l	ACL
Benzo[a]pyrene	**50-32-8**	**0.2**	**µg/l**	**MCL**
Benzyl alcohol	100-51-6	4,695	µg/l	ACL
Beryllium	**---**	**10**	**µg/l**	**BKG**
BHC-alpha	319-84-6	0.011	µg/l	ACL
BHC-beta	319-85-7	0.037	µg/l	ACL
BHC-delta	319-86-8	(0)*	µg/l	ACL
BHC-gamma (Lindane)	**58-89-9**	**0.2**	**µg/l**	**MCL**
Bis(2-chloroethoxy)methane	111-91-1	47	µg/l	ACL
Bis(2-chloroethyl)ether / Dichloroethyl ether	111-44-4	0.009	µg/l	ACL
Bis(2-chloro-1-methylethyl)ether / 2,2-Dichlorodiisopropyl ether	108-60-1	0.26	µg/l	ACL
Bis(2-ethylhexyl)phthalate	**117-81-7**	**6**	**µg/l**	**MCL**
Bromochloromethane / Chlorobromomethane	74-97-5	(0)*	µg/l	ACL
Bromodichloromethane **Bromoform** **Chloroform** **Dibromochloromethane** *****(trihalomethane group)**	**75-27-4** **75-25-2** **67-66-3** **124-48-1**	**80**	**µg/l**	**MCL**
Bromoform / Tribromomethane				
4-Bromophenyl phenyl ether	101-55-3	(0)*	µg/l	ACL
Butyl benzyl phthalate / Benzyl butyl phthalate	85-68-7	3130	µg/l	ACL
Cadmium	**---**	**5**	**µg/l**	**MCL**
Carbon disulfide	75-15-0	391	µg/l	ACL
Carbon tetrachloride	**56-23-5**	**5**	**µg/l**	**MCL**
Chlordane	**N/E**	**2**	**µg/l**	**MCL**
p-Chloroaniline / 4-Chloroaniline	106-47-8	62.6	µg/l	ACL
Chlorobenzene	**108-90-7**	**100**	**µg/l**	**MCL**
Chlorobenzilate	510-15-6	0.248	µg/l	ACL
p-Chloro-m-cresol / 4-Chloro-3-methylphenol	59-50-7	10,955	µg/l	ACL
Chloroethane / Ethyl chloride	75-00-3	3.638	µg/l	ACL
Chloroform / Trichloromethane				
2-Chloronaphthalene	91-58-7	179	µg/l	ACL
2-Chlorophenol	95-57-8	11.2	µg/l	ACL

4-Chlorophenyl phenyl ether	7005-72-3	(0)*	µg/l	ACL
Chloroprene	126-99-8	5.13	µg/l	ACL
Chromium	**---**	**100**	**µg/l**	**MCL**
Chrysene	218-01-9	9.17	µg/l	ACL
Cobalt	---	156.5	µg/l	ACL
Copper	---	626	µg/l	ACL
m-Cresol / 3-Methylphenol	108-39-4	783	µg/l	ACL
o-Cresol / 2-Methylphenol	95-48-7	783	µg/l	ACL
p-Cresol / 4-Methylphenol	106-44-5	78.3	µg/l	ACL
Cyanide	**57-12-5**	**200**	**µg/l**	**MCL**
2,4-D / 2,4-Dichlorophenoxyacetic acid	**94-75-7**	**70**	**µg/l**	**MCL**
4, 4-DDD	72-54-8	0.279	µg/l	ACL
4,4-DDE	72-55-9	0.197	µg/l	ACL
4,4-DDT	50-29-3	0.197	µg/l	ACL
Diallate	2303-16-4	0.173	µg/l	ACL
Dibenz[a,h]anthracene	53-70-3	0.009	µg/l	ACL
Dibenzofuran	132-64-9	(0)*	µg/l	ACL
Dibromochloromethane / Chlorodibromomethane				
1,2-Dibromo-3-chloropropane / DBCP	**96-12-8**	**0.2**	**µg/l**	**MCL**
1,2-Dibromoethane / Ethylene dibromide	**106-93-4**	**0.05**	**µg/l**	**MCL**
Di-n-butyl phthalate	84-74-2	1,565	µg/l	ACL
Di-n-octyl phthalate	117-84-0	313	µg/l	ACL
0-Dichlorobenzene / 1,2-Dichlorobenzene	**95-50-1**	**600**	**µg/l**	**MCL**
m-Dichlorobenzene / 1,3-Dichlorobenzene	541-73-1	6.71	µg/l	ACL
p-Dichlorobenzene / 1,4-Dichlorobenzene	**106-46-7**	**75**	**µg/l**	**MCL**
3,3-Dichlorobenzidine	91-94-1	0.149	µg/l	ACL
Trans-1,4-Dichloro-2-butene	110-57-6	(0)*	µg/l	ACL
Dichlorodifluoromethane / CFC-12	75-71-8	125.2	µg/l	ACL
1,1-Dichloroethane / Ethylidene chloride	75-34-3	327	µg/l	ACL
1,2-Dichloroethane / Ethylene dichloride	**107-06-2**	**5**	**µg/l**	**MCL**
1,1-Dichloroethylene / 1,1-Dichloroethene	**75-35-4**	**7**	**µg/l**	**MCL**
Cis-1,2-Dichloroethylene / Cis-1,2-Dichloroethene	**156-59-2**	**70**	**µg/l**	**MCL**
Trans-1,2-Dichloroethylene / Trans-1,2-Dichloroethene	**156-60-5**	**100**	**µg/l**	**MCL**
2,4-Dichlorophenol	120-83-2	47	µg/l	ACL
2,6-Dichlorophenol	87-65-0	(0)*	µg/l	ACL
1,2-Dichloropropane / Propylene dichloride	**78-87-5**	**5**	**µg/l**	**MCL**
1,3-Dichloropropane / Trimethylene dichloride	142-28-9	44.7	µg/l	ACL
2,2-Dichloropropane / Isopropylidene chloride	594-20-7	(0)*	µg/l	ACL
1,1-Dichloropropene	563-58-6	(0)*	µg/l	ACL
Cis-1,3-Dichloropropene	10061-01-5	(0)*	µg/l	ACL
Trans-1,3-Dichloropropene	10061-02-6	(0)*	µg/l	ACL
Dieldrin	60-57-1	0.004	µg/l	ACL
Diethyl phthalate	84-66-2	12,520	µg/l	ACL
O,O-Diethyl O-2-pyrazinyl phosphorothioate / Thionazin	297-97-2	(0)*	µg/l	ACL
Dimethoate	60-51-5	3.13	µg/l	ACL
p-(Dimethylamino)azobenzene / Azobenzene	60-11-7	(0)*	µg/l	ACL
7,12-Dimethylbenz [a] anthracene	57-97-6	0.0003	µg/l	ACL
3,3-Dimethylbenzidine	119-93-7	(0)*	µg/l	ACL
2,4-Dimethylphenol / m-Xyenol	105-67-9	313	µg/l	ACL
Dimethyl phthalate	131-11-3	(0)*	µg/l	ACL
m-Dinitrobenzene	99-65-0	1.565	µg/l	ACL

4,6-Dinitro-o-cresol / 4,6-Dinitro-2-methylphenol	534-52-1	1.565	µg/l	ACL
2,4-Dinitrophenol	51-28-5	31.3	µg/l	ACL
2,4-Dinitrotoluene	121-14-2	31.3	µg/l	ACL
2,6-Dinitrotoluene	606-20-2	15.65	µg/l	ACL
2-sec-Butyl-4,6-dinitrophenol / Dinoseb	**88-85-7**	**7**	**µg/l**	**MCL**
Diphenylamine	122-39-4	391	µg/l	ACL
Disulfoton	298-04-4	0.63	µg/l	ACL
Endosulfan I	959-96-8	93.9	µg/l	ACL
Endosulfan II	33213-65-9	(0)*	µg/l	ACL
Endosulfan sulfate	1031-07-8	(0)*	µg/l	ACL
Endrin	**72-20-8**	**2**	**µg/l**	**MCL**
Endrin aldehyde	7421-93-4	(0)*	µg/l	ACL
Ethylbenzene	**100-41-4**	**700**	**µg/l**	**MCL**
Ethyl methacrylate	97-63-2	201	µg/l	ACL
Ethyl methanesulfonate	62-50-0	(0)*	µg/l	ACL
Famphur	52-85-7	(0)*	µg/l	ACL
Fluoranthene	206-44-0	626	µg/l	ACL
Fluorene	86-73-7	89.4	µg/l	ACL
Heptachlor	**76-44-8**	**0.4**	**µg/l**	**MCL**
Heptachlor epoxide	**1024-57-3**	**0.2**	**µg/l**	**MCL**
Hexachlorobenzene	**118-74-1**	**1**	**µg/l**	**MCL**
Hexachlorobutadiene	87-68-3	0.86	µg/l	ACL
Hexachlorocyclopentadiene	**77-47-4**	**50**	**µg/l**	**MCL**
Hexachloroethane	67-72-1	4.784	µg/l	ACL
Hexachloropropene	1888-71-7	(0)*	µg/l	ACL
2-Hexanone / Methyl butyl ketone	591-78-6	1120	µg/l	ACL
Indeno [1,2,3-cd] pyrene	193-39-5	0.092	µg/l	ACL
Isobutyl alcohol / Isobutanol	78-83-1	671	µg/l	ACL
Isodrin	465-73-6	(0)*	µg/l	ACL
Isophorone	78-59-1	70.5	µg/l	ACL
Isosafrole	120-58-1	(0)*	µg/l	ACL
Kepone	143-50-0	7.83	µg/l	ACL
Lead	**---**	**37**	**µg/l**	**BKG**
Mercury (inorganic)	**---**	**2**	**µg/l**	**MCL**
Methacrylonitrile	126-98-7	0.39	µg/l	ACL
Methapyrilene	91-80-5	(0)*	µg/l	ACL
Methoxychlor	**72-43-5**	**40**	**µg/l**	**MCL**
Methyl Bromide / Bromomethane	74-83-9	3.13	µg/l	ACL
Methyl Chloride / Chloromethane	74-87-3	58.1	µg/l	ACL
3-Methylcholanthrene	56-49-5	0.003	µg/l	ACL
Methylene bromide	74-95-3	22.36	µg/l	ACL
Methylene chloride	**75-09-2**	**5**	**µg/l**	**MCL**
Methyl Ethyl Ketone / MEK / 2-Butanone	78-93-3	2,630	µg/l	ACL
Methyl iodide / Iodomethane	74-88-4	(0)*	µg/l	ACL
Methyl methacrylate	80-62-6	510	µg/l	ACL
Methyl methanesulfonate	66-27-3	(0)*	µg/l	ACL
2 Methylnaphthalene	91-57-6	8.94	µg/l	ACL
Methyl parathion / Parathion methyl	298-00-0	3.91	µg/l	ACL
4-Methyl-2-pentanone / Methyl isobutyl ketone	108-10-1	1,923	µg/l	ACL
Naphthalene	91-20-3	2.33	µg/l	ACL
1,4-Naphthoquinone	130-15-4	(0)*	µg/l	ACL
1-Naphthylamine	134-32-7	(0)*	µg/l	ACL
2-Naphthylamine	91-59-8	0.037	µg/l	ACL
Nickel	---	313	µg/l	ACL
o-Nitroaniline / 2-Nitroaniline	88-74-4	(0)*	µg/l	ACL
m-Nitroaniline / 3-Nitroaniline	99-09-2	3.35	µg/l	ACL
p-Nitroaniline / 4-Nitroaniline	100-01-6	3.35	µg/l	ACL
Nitrobenzene	98-95-3	1.30	µg/l	ACL

o-Nitrophenol / 2-Nitrophenol	88-75-5	(0)*	µg/l	ACL
p-Nitrophenol / 4-Nitrophenol	100-02-7	(0)*	µg/l	ACL
N-Nitrosodi-n-butylamine	924-16-3	0.002	µg/l	ACL
N-Nitrosodiethylamine	55-18-5	0.0004	µg/l	ACL
N-Nitrosodimethylamine	62-75-9	0.0013	µg/l	ACL
N-Nitrosodiphenylamine	86-30-6	13.7	µg/l	ACL
N-Nitrosodipropylamine / Di-n-propylnitrosamine	621-64-7	0.01	µg/l	ACL
N-Nitrosomethylethylamine	10595-95-6	0.003	µg/l	ACL
N-Nitrosopiperidine	100-75-4	0.01	µg/l	ACL
N-Nitrosopyrrolidine	930-55-2	0.03	µg/l	ACL
5-Nitro-o-toluidine	99-55-8	2.03	µg/l	ACL
Parathion	56-38-2	93.9	µg/l	ACL
Polychlorinated biphenyls / PCB's	**---**	**0.5**	**µg/l**	**MCL**
Pentachlorobenzene	608-93-5	12.5	µg/l	ACL
Pentachloronitrobenzene	82-68-8	0.26	µg/l	ACL
Pentachlorophenol	**87-86-5**	**1**	**µg/l**	**MCL**
Phenacetin	62-44-2	30.4	µg/l	ACL
Phenanthrene	85-01-8	(0)*	µg/l	ACL
Phenol	108-95-2	4,695	µg/l	ACL
p-Phenylenediamine	106-50-3	2,973	µg/l	ACL
Phorate	298-02-2	(0)*	µg/l	ACL
Pronamide	23950-58-5	1,173	µg/l	ACL
Propionitrile / Ethyl cyanide	107-12-0	(0)*	µg/l	ACL
Pyrene	129-00-0	67.1	µg/l	ACL
Safrole	94-59-7	0.304	µg/l	ACL
Selenium	**---**	**50**	**µg/l**	**MCL**
Silver	---	78.3	µg/l	ACL
Silvex / 2,4,5-TP	**93-72-1**	**50**	**µg/l**	**MCL**
Styrene	**100-42-5**	**100**	**µg/l**	**MCL**
Sulfide	**18496-25-8**	**3.39**	**µg/l**	**BKG**
1,2,4,5-Tetrachlorobenzene	95-94-3	4.69	µg/l	ACL
1,1,1,2-Tetrachloroethane	630-20-6	0.406	µg/l	ACL
1,1,2,2-Tetrachloroethane	79-34-5	0.053	µg/l	ACL
Tetrachloroethylene / PCE	**127-18-4**	**5**	**µg/l**	**MCL**
2,3,4,6-Tetrachlorophenol	58-90-2	470	µg/l	ACL
Thallium	**---**	**2**	**µg/l**	**MCL**
Tin	---	9,390	µg/l	ACL
Toluene	**108-88-3**	**1,000**	**µg/l**	**MCL**
o-Toluidine / 2-Methylaniline	95-53-4	0.28	µg/l	ACL
Toxaphene	**N/E**	**3**	**µg/l**	**MCL**
1,2,4-Trichlorobenzene	**120-82-1**	**70**	**µg/l**	**MCL**
1,1,1-Trichloroethane / Methylchloroform	**71-55-6**	**200**	**µg/l**	**MCL**
1,1,2-Trichloroethane	**79-00-5**	**5**	**µg/l**	**MCL**
Trichloroethylene / Trichloroethene	**79-01-6**	**5**	**µg/l**	**MCL**
Trichlorofluoromethane / CFC-11	75-69-4	470	µg/l	ACL
2,4,5-Trichlorophenol	95-95-4	1,565	µg/l	ACL
2,4,6-Trichlorophenol	88-06-2	6.09	µg/l	ACL
2,4,5-Trichloro-phenoxyacetic acid	93-76-5	157	µg/l	ACL
1,2,3-Trichloropropane	96-18-4	0.005	µg/l	ACL
O,O,O-Triethyl phosphorothioate	126-68-1	(0)*	µg/l	ACL
1,3,5-Trinitrobenzene	99-35-4	470	µg/l	ACL
Vanadium	**---**	**76**	**µg/l**	**BKG**
Vinyl acetate	108-05-4	148	µg/l	ACL
Vinyl chloride / Chloroethene	**75-01-4**	**2**	**µg/l**	**MCL**
Xylene (total)	**N/E**	**10,000**	**µg/l**	**MCL**
Zinc	---	4,695	µg/l	ACL

<table>
<tr><th colspan="5">End Notes</th></tr>
<tr><td colspan="5">MCL >USEPA Maximum Contaminant Level, represents Federal standards set for drinking water under the Safe Drinking Water Act. If a revised MCL is promulgated by EPA for any constituent on this listing, the new MCL shall immediately be adopted as the groundwater protection standard.</td></tr>
<tr><td colspan="5">MCL^a > USEPA MCL "action level" (non-risk based), used as ACL for Lead.</td></tr>
<tr><td colspan="5">ACL > Alternate Concentration Limits (risk-based). In those cases where the ACL value listed in this table is found to be less than the laboratory Limit of Quantitation (LOQ) for the constituent, the LOQ shall serve as the "ACL" for statistical comparison purposes.</td></tr>
<tr><td colspan="5">For facilities which obtained an approved state-wide ACL variance in 2007, or an initial Variance in 2007; when REAMS-based ACL's are revised in the future based on new EPA toxicity and/or health risk criteria, those ACL's shall immediately be adopted for use as the groundwater protection standard (GPS). The Department will release ACL updates twice a year on June 30th and December 31st of each calendar year.</td></tr>
<tr><td colspan="5">For facilities which desire to use non REAMS-based ACL values, the use of those ACL's as GPS must be approved via the Variance procedure outlined in the VSWMR.</td></tr>
<tr><td colspan="5">BKG > Site specific background concentration data, as approved by DEQ.</td></tr>
<tr><td colspan="5">µg/l > micrograms per liter (parts per billion).</td></tr>
<tr><td colspan="5">(0)* > Indicates those constituents which have no established ACL. In cases such as these, the laboratory Limit of Quantitation (LOQ) for the constituent shall serve as the "ACL" for statistical comparison purposes.</td></tr>
<tr><td colspan="5">CAS RN > Chemical Abstracts Service Registry Number.</td></tr>
<tr><td colspan="5">Shaded Rows (if any) denote those groundwater constituents for which Groundwater Protection Standards are set as MCL's.</td></tr>
<tr><td colspan="5">The MCL for the Trihalomethane group is a cumulative number of 80 ppb, for one, two, or all of the constituents.</td></tr>
<tr><td>A GPS exceedance is triggered for a sampling event when there is a statistical exceedance of:</td><td>1) an MCL</td><td>2) an ACL</td><td>3) site specific background</td><td>4) the lab LOQ, when MCL, BKG, or ACL is unavailable</td></tr>
</table>

APPENDIX F

GROUNDWATER LEVEL LOG

•

DAILY FIELD LOG

•

SAMPLING LOG

•

CHAIN-OF-CUSTODY

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Groundwater Potentiometric Level Measurement Log

SPSA
SOUTHEASTERN PUBLIC SERVICE AUTHORITY OF VIRGINIA

Project Name: SPSA Regional Sanitary Landfill - Permit No. 417

Date:

Well Number	Time	Depth to Water (ft)	Depth to Bottom (ft)	Water Column Thickness (ft)	Reference Point Elevation (ft, MSL)	Potentiometric Elevation (ft, MSL)	Remarks

Field Personnel: ______________________ Checked By: ______________________

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DAILY FIELD REPORT

SPSA
SOUTHEASTERN PUBLIC SERVICE AUTHORITY OF VIRGINIA

Project Name: Isle of Wight Closed Sanitary Landfill - Permit No. 87

Field Manager:

Date:

Field Personnel:

Weather:

Labor	Hours	Equipment	Materials

Field Observations:

Submitted by:

Reviewed by:

Well Sampling / MicroPurge Log

SPSA
SOUTHEASTERN PUBLIC SERVICE AUTHORITY OF VIRGINIA

Project Name: SPSA Regional Sanitary Landfill - Permit No. 410	**Sheet:** **of**
Well Number:	**Date:**
Well Diameter (in):	**1 Well Volume (gal):**
Top of Casing Elevation (ft, MSL):	**3 Well Volumes (gal):**
Total Well Depth (ft):	**Controller Settings:**
Depth to Water (ft):	**Purging Time Initiated:**
Water Column Thickness (ft):	**Purging Time Completed:**
Water Column Elevation (ft, MSL):	**Total Gallons Purged:**

WELL PURGING RECORD

Time	Volume Purged (gallons)	Temperature (°C)	pH (s.u.)	Specific Conductance (uS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Comments (water color, odor, sediment, cloudy, etc.)

GROUNDWATER SAMPLING RECORD

Sample Number	Collection Time	Parameter	Container	Preservative

Samples Shipped By: ______________________ Laboratory: ______________

Sampled By: ______________________ Checked By: ______________

AIR WATER & SOIL LABORATORIES, INC.

2109A NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230
(804) 358-8295 PHONE
(804)358-8297 FAX

CHAIN OF CUSTODY

PAGE ______ OF _____

CLIENT NAME:		PROJECT NAME:
CLIENT CONTACT:		SITE NAME:
CLIENT ADDRESS:		PROJECT NUMBER:
CLIENT PHONE NUMBER:		P.O. NUMBER:
CLIENT FAX NUMBER:	EMAIL:	REGULATORY AUTHORITY:
Is sample for compliance reporting? YES NO	Is sample from a chlorinated supply? YES NO	PWS I.D. #:
SAMPLER NAME (PRINT):	SAMPLER SIGNATURE:	**Turn Around Time:** **Day(s)**

Have ammonia and TKN samples been verified to be dechlorinated at the time of sampling?: YES NO

									MATRIX						ANALYSIS							COMMENTS
CLIENT SAMPLE I.D.	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Number of Containers	Grab	Composite	Field Filtered (Dissolved Metals)	Ground Water / Surface Water	Waste Water / Storm Water	Drinking Water	Soil	Solids	Other ______								Quote I.D.: PLEASE NOTE PRESERVATIVE(S) or PUMP RATE (L/min)
1)																						
2)																						
3)																						
4)																						
5)																						
6)																						
7)																						
8)																						
9)																						
10)																						

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	**QC Data Package** Level I ☐ Level II ☐ Level III ☐ Level IV ☐	**LAB USE ONLY** **COOLER TEMP** ________°C
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME		
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME		

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PERMIT MODULE – XI

ASSESSMENT MONITORING
9 VAC 20-80-300.A and B.3

Assessment monitoring is designed to ensure the earliest possible recognition of a leachate release to groundwater from a regulated solid waste management unit at levels which exceed groundwater protection standards.

XI.A. GROUNDWATER COMPLIANCE POINT

XI.A.1 Uppermost Aquifer

The compliance point for groundwater monitoring is the uppermost aquifer on site [9 VAC 20-80-300.A.2.a]. The uppermost aquifer encompasses the entire thickness between the first encounter with groundwater (not to include any perched water) and the first encounter with a confining unit forming the lower boundary of the uppermost aquifer [9 VAC 20-80-300.A.3.f.(1).(b)].

XI.A.2 Monitoring Well Locations

All wells in the monitoring network shall be installed within the permitted facility boundary [9 VAC 20-80-770.A], screened within the uppermost aquifer, and located at, or as close as practical to, the SWMU boundary [9 VAC 20-80-300.A.3.a] unless a variance meeting the requirements of 9 VAC 20-80-770.B has been granted. No monitoring well serving the function defined under 9 VAC 20-80-300.A.3.a can be located more than 500 feet away from the SWMU boundary [9 VAC 20-80-770.A].

XI.B. MONITORING NETWORK REQUIREMENTS

XI.B.1 Performance Standards

XI.B.1.a The Permittee shall install a groundwater monitoring network that meets the requirements of 9 VAC 20-80-300.A.2 and A.3.

XI.B.1.b All wells utilized in the monitoring network shall at a minimum meet the requirements of 9 VAC 20-80-300.A.3.c and f.(1).

XI.B.1.c Any wells that require abandonment shall be sealed and abandoned in accordance with existing EPA Resource Conservation and Recovery Act guidance as well as any applicable state or local requirements.

XI.B.1.d If any wells require replacement due to non-performance, the Permittee shall:

XI.B.1.e.(1) Within 30 days of recognizing the non-performance, notify the Department of the need to replace the non-performing well. Within that notification, provide for Department review [9 VAC 20-80-570.C.1], the proposed location for the new well shown on a site plan.

XI.B.1.e.(2) Install the replacement well, prior to the next regularly scheduled groundwater sampling event unless the Director has granted an extension to meeting the monitoring system compliance requirements under 9 VAC 20-80-300.A.3.a.

XI.B.2 Operations and Maintenance

The Permittee shall operate and maintain all wells in the monitoring network in a manner meeting the requirements of 9 VAC 20-80-300.A.3.e.

XI.B.3 Well Designations

At a minimum, the monitoring network installed must meet the requirements of 9 VAC 20-80-300.A.3.f.(2). The following wells are included in the monitoring network:

Upgradient Well(s)	Downgradient Wells	
MW-10	MW-4R	MW-27^{S}
MW-16	MW-11	MW-28^{S}
MW-37^{PS}	MW-12	MW-29^{S}
MW-10B	MW-15	MW-30^{S}
	MW-19	MW-31^{PS}
	MW-21	MW-32^{PS}
	MW-22R*^{S}	MW-33^{PS}
	MW-24^{S}	MW-34^{PS}
	MW-25^{S}	MW-35^{PS}
	MW-26^{S}	MW-36^{PS}

* - Wells MW-9 and MW-22R are located with in the permitted unit boundary of Cell VII. As such, the wells must be abandoned upon commencement of construction activities for Cell VII. MW-9 and MW-22R will be properly abandoned in accordance with XI.I.6 of this module.

^{P} – Denotes monitoring wells to be installed during construction of Cell VII.

^{S} – Denotes non-subset wells, at the time of permit issuance, which may continue to monitor a reduced set of constituents as described in the subset approval correspondence dated March 3, 2005 and included as Permit Attachment I-3.

XI.C AQUIFER INFORMATION

XI.C.1 Aquifer Data Acquisition - Requirements and Response

XI.C.1.a Static groundwater elevations shall be:

XI.C.1.a.(1) measured in all monitoring wells in a manner that meets the requirements of 9 VAC 20-80-300.A.4.c.

XI.C.1.a.(2) measured to an accuracy of 0.01 foot.

XI.C.1.a.(3) obtained from all wells in the network within a single 24 hour period to avoid temporal variations/fluctuations in the groundwater table.

XI.C.1.b Each time groundwater is sampled on site, the Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer using methods accepted for use in EPA RCRA programs. [9 VAC 20-80-300.A.4.c]

XI.C.1.c The Permittee shall evaluate the function of each of the wells included in the monitoring network using the static groundwater elevation data obtained each time groundwater is sampled. If the evaluation shows that one or more of the monitoring well(s) no longer functions in a manner that meets the requirements of 9 VAC 20-80-300.A.3.e, the Permittee shall:

XI.C.1.c.(1) Within 30 days of recognizing the non-performance, notify the Department of the need to modify the number, location, or depth of the monitoring wells, and provide for Department review, proposed locations for new (replacement) monitoring wells keyed to a site plan.

XI.C.1.c.(2) Complete additions or modifications to the network, prior to the next regularly scheduled groundwater sampling event, unless an extension has been granted by the Director for meeting the monitoring system compliance requirements under 9 VAC 20-80-300.A.3.a.

XI.D. SAMPLING REQUIREMENTS

The Permittee shall meet the following:

XI.D.1 Field sampling and laboratory procedures shall at a minimum meet the requirements of 9 VAC 20-80-300.A.4.a.

XI.D.2 Sampling and analytical methods shall at a minimum meet those set forth in EPA SW-846 as amended [9 VAC 20-80-300.A.4.b].

XI.D.3 Samples shall not be filtered prior to analysis.

XI.D.4 The Permittee shall sample the groundwater for the Table 5.1 Assessment monitoring constituents referenced under 9 VAC 20-80-300.B.3.b at least once a year.

XI.D.5 Permittee shall sample the groundwater for the full Table 5.5 Detection monitoring list plus all previously detected Table 5.1 Assessment monitoring constituents during the semi-annual or quarterly sampling events. [9 VAC 20-80-300.B.3.d.(2)]

XI.E SAMPLING FREQUENCY

XI.E.1 Unless otherwise required when sampling to determine background, the Permittee shall, during the active life and post-closure care periods:

XI.E.1.a Upon triggering the need for Assessment monitoring, the initial Assessment sampling event shall be completed in a timeframe consistent with 9 VAC 20-80-300.B.3.b.

XI.E.1.b After completion of the initial Assessment sampling event and then throughout the rest of the active life and post closure care periods, groundwater shall be sampled and analyze at all assessment monitoring wells on at least a semi-annual basis [9 VAC 20-80-300.B.3.d.(2)] unless the quarterly wetlands provisions apply [9 VAC 20-80-300.B.1.e].

XI.E.2 The length of the semi-annual sampling period shall not exceed 180 days [9 VAC 20-80-300.B.2.a.(1)].

XI.E.3 For facilities which continued to receive waste after June 30, 1999, the sampling requirements noted above may be superseded by the requirement to sample quarterly based on proximity to wetlands [9 VAC 20-80-300.B.1.e]

XI.F DETERMINATION OF BACKGROUND & GPS

XI.F.1 The Permittee shall establish site-specific background values for all detected Assessment monitoring constituents (not previously detected during Detection monitoring) in manner consistent with the requirements of 9 VAC 20-80-300.A.4.d – f and 300.B.3.d.(3).

XI.F.2 Background concentrations shall be established within timelines that meet the requirements of 9 VAC 20-80-300.B.3.d.(3).

XI.F.3 Groundwater Protection Standards (GPS) for each detected Assessment monitoring constituent shall be:

XI.F.3.a proposed within timelines that meet the requirements of 9 VAC 20-80-300.B.3.d.(4)**,** and

XI.F.3.b established as defined under 9 VAC 20-80-300.B.3.h or 3.i

XI.F.4 Groundwater Protection Standards become effective as follows:

XI.F.4.a Federal Maximum Contaminant Level-based GPS are effective immediately on the date GPS are proposed by the Permittee [9 VAC 20-80-300.B.3.h.(1)].

XI.F.4.b Background-based GPS are effective on the date Director approval is issued [9 VAC 20-80-300.B.3.h.(2 or 3)].

XI.F.4.c Alternate Concentration Limit-based GPS are effective on the date the Director approved variance is issued [9 VAC 20-80-300.B.3.i; and 760.C.1].

XI.G. STATISTICAL PROCEDURES

When evaluating the groundwater sampling event results, the Permittee shall:

XI.G.1 use a statistical test meeting the requirements of 9 VAC 20-80-300.D.

XI.G.2 within <u>30</u> days of completion of the laboratory analysis for each sampling event

[9 VAC 20-80-300.A.4.h.(2)], determine whether or not there is a statistically significant increase over site background for each monitoring constituent using a method meeting the requirements of 9 VAC 20-80-300.A.4.h.(1) and 300.A.4.g.

XI.G.3 for the purpose of this Permit, laboratory analysis is considered complete upon issuance of the analytical report under laboratory signature.

XI.H ADDRESSING GPS EXCEEDANCES

When a Permittee has determined there has been a SSI exceedance over GPS for one or more of the monitoring constituents, the Permittee shall:

XI.H.1 notify the Director within 14 days of the determination of exceedance, utilizing the statistical methods described in Part II Section H.5.a of the GMP. The notification must indicate which groundwater monitoring constituents have shown statistically significant increases over GPS and describe whether the Permittee shall:

XI.H.2 initiate Corrective Actions described under 9 VAC 20-80-310.A within the timeframes of 9 VAC 20-80-300.B.3.g.(1).(d) including defining the horizontal and lateral extent of the GPS exceeding release and notifying any impacted landowners as required under 9 VAC 20-80-300.B.3.g.(1).(a – c) or

XI.H.3 submit an Alternate Source Demonstration [9 VAC 20-80-300.B.3.g.(2)] meeting the content requirements and timeframe of 9 VAC 20-80-300.A.5**.** Unless Director approval of the demonstration is obtained, the Permittee shall follow the requirements and timeframes of 9 VAC 20-80-300.B.3.g.(1).

XI.I. RECORD-KEEPING REQUIREMENTS

The Permittee shall retain all records identified under 9 VAC 20-80-300.E.1 as well as 9 VAC 20-80-570.B.1 and B.2 throughout the active life (including closure) and post-closure care period.

The records shall be retained at the facility or another location approved by the Director.

XI.J REPORTING REQUIREMENTS

XI.J.1 *Annual groundwater reports* containing at a minimum the content described under 9 VAC 20-80-300.E.2.b, shall be submitted to the Director no later than March 1st of each calendar year.

XI.I.2 *Semi-annual groundwater evaluations* containing at a minimum, the groundwater flow rate and direction determinations required under 9 VAC 20-80-300.A.4.c and the results of the inter-well statistical comparisons required under 9VAC 20-80-300.B.3.e – g shall be submitted to the Department within 180 days of each semi-annual (or quarterly) sampling event.

XI.I.3 While background is being established, the Permittee shall report to the Director, within 15 days of receipt of the data from the laboratory, the *laboratory analytical results* for each background sampling event. [9 VAC 20-80-300.E.2.a]

XI.I.4. Within 30 days of establishing facility background, or re-establishing background due to the installation of new monitoring wells, or a change in sampling technique, the Permittee shall report the background values and statistical computations necessary to determine the values in a report entitled *Facility Background Determination Report*.

XI.I.5 Within 44 days of well completion, the Permittee shall supply the Director a *Well Installation Report* containing the well number, surveyed elevation, boring log, casing length, total depth, and a completion diagram for each monitoring well, along with a certification from a qualified groundwater scientist that the monitoring wells have been installed in accordance with the submitted plans [9 VAC 20-80-300.A.3.d; 300.A.3.f.(3), and 300.E.1.c].

XI.I.6 Within 44 days of well abandonment, the Permittee shall supply the Director a *Well Abandonment Report* containing information including field methods utilized, and a certification from a qualified groundwater scientist verifying the well abandonment activities met all applicable requirements [9 VAC 20-80--300.E.1.c].

XI.I.7 Upon issuance of GPS, the Permittee shall place the GPS listing in the operating record and update that record as needed upon any changes in GPS. [9 VAC 20-80-300.B.3.d.(4)]

XI.J NOTIFICATION REQUIREMENTS

XI.J.1 *GPS SSI Notifications* shall be submitted to the Director within the timeframes noted under 9 VAC 20-80-300.A.4.h.(2) and B.3.g.

XI.J.2 *Well Non-Performance Notifications* shall be submitted to the Director within 30 days of recognizing the non-performance of one or more wells in order to meet 9 VAC 20-80-570.C.1 - 3.

XI.J.3 *Table 5.1 Detect Notifications* shall be submitted to the Director within the timeframes noted under 9 VAC 20-80-300.B.3.d.(1).

XI.J.4 *Return to Detection Monitoring Notification* shall be submitted to the Director no less than 30-days prior to re-instating Detection monitoring. [9 VAC 20-80-300.B.3.e]

XI.J.5 *Off-site Plume Notifications*, if indicated by the existing monitoring network, shall be submitted to the affected landowner and copied to the Director within 14-days of identifying the impacts. [9 VAC 20-80-300.B.3.g.(1).(c)]

XI.K. MISCELLANEOUS ALLOWANCES

XI.K.1 Alternate Site Background. The Permittee may request the Director allow site background to be developed using wells that are not hydrologically upgradient of the SWMU as long as the request addresses the technical criteria contained under 9 VAC 20-80-300.A.4.e, and is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, background shall be determined by sampling wells which are upgradient of the SWMU and meet the requirements of 9 VAC 20-80-300.A.3.f.(2).

XI.K.2 Alternate Statistical Method. The Permittee may request the Director allow the use of an Alternate Statistical Method as long as the Permittee can demonstrate the alternate method can meet the technical criteria defined under 9 VAC 20-80-300.D.2. Until such time as Director approval is obtained, the statistical test(s) applied to site groundwater data shall be one from 9 VAC 20-80-300.D.1.a – d. Whichever method is approved for use at the site, the method should be listed in the facility *Groundwater Monitoring Plan* as required under 9 VAC 20-80-300.A.4.g.

XI.K.3 Verification Sampling. The Permittee, at any time within the 30 day statistical determination period defined under 9 VAC 20-80-300.A.4.h.(2), may obtain verification samples if the initial review of analytical data suggests results which might not be an accurate reflection of groundwater quality. Undertaking verification sampling is a voluntary action and shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9 VAC 20-80-300.A.4.h.(2) or B.3.g.

XI.K.4 Data Validation. The owner or operator may at any time within the 30 day statistical determination period defined under 9 VAC 20-80-300.A.4.h.(2), undertake third-party data validation of the analytical data received from the laboratory. Undertaking such validation efforts are a voluntary action and shall not alter the timeframes associated with determining or reporting a statistically significant increase as otherwise defined under 9 VAC 20-80-300.A.4.h.(2) or B.3.g.

XI.K.5 The Permittee may request the Director allow an alternate frequency for the repeated sampling of the full Table 5.1 constituent list as long as the request addresses the technical items contained under 9 VAC 20-80-300.B.3.c, and is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, sampling for the full Table 5.1 shall continue on an annual basis consistent with 9 VAC 20-80-300.B.3.b**.**

XI.K.6 In an effort to reduce sampling costs, the Permittee may request the Director:

XI.K.6.a allow a subset of wells to be sampled for the annual full Table 5.1 constituent list [9 VAC 20-80-300.B.3.b] as long as the request contains information showing that wells not included in the subset are 1] devoid of any Table 5.1 detects, 2] the well shows no exceedances over background, and 3] the request is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, all site wells shall be sampled annually for the Table 5.1 constituent list consistent with 9 VAC 20-80-300.B.3.b, and/or

XI.K.6.b allow for the deletion of certain Table 5.1 constituents from the sampling list [9 VAC 20-80-300.B.3.b] as long as the request contains information showing that the constituents are not reasonably expected to be in or derived from the waste mass, and the request is certified by a qualified groundwater scientist. Until such time as Director approval is obtained, all site wells shall be sampled annually for the full Table 5.1 constituent list consistent with 9 VAC 20-80-300.B.3.b**.**

XI.L. MISCELLANEOUS DEMONSTRATIONS

XI.L.1 To address an exceedance which is the result of something other than a release of solid waste constituents from the SWMU, the Permittee may submit a report entitled *Alternate Source Demonstration*, certified by a qualified groundwater scientist, for review by the Director within 90 days of providing the SSI notification unless the submission and approval timeframe has been extended by the Director for good cause. [9 VAC 20-80-300.A.5**]**

XI.L.1.a If a successful demonstration of an alternate source for the noted increase is made by the Permittee and approved by the Director within the 90 day timeframe, the Permittee may continue in the Detection monitoring program as defined in this Permit Module.

XI.L.1.b If a successful demonstration of an alternate source for the noted increase is not made by the Permittee within the 90 day timeframe, the Permittee shall take actions required under 9 VAC 20-80-300.B.3.g.(1) under the Regulatory timeframes unless an extension has been granted by the Director.

XI.L.2 The Permittee may submit to the Director, a *Multi-unit Groundwater Monitoring System Demonstration* containing the content defined under 9 VAC 20-80-300.A.3.b and certified by a qualified groundwater scientist, when he feels that the implementation of such a monitoring system will be as protective of human health and the environment as individual systems would be.

XI.L.2.a If a successful demonstration is made and approved by the Director, the Permittee may discontinue use of individual monitoring systems and institute the monitoring of a multi-unit system.

XI.L.2.b If a successful demonstration is not made, the Permittee shall initiate (or continue) to monitor individual networks under Detection monitoring.

XI.L.3 The Permittee may request the Director suspend groundwater monitoring requirements by submitting a *No-Potential-Migration Demonstration*, certified by a qualified groundwater scientist, meeting the technical requirements of 9 VAC 20-80-300.A.1.c.

XI.L.3.a If a successful demonstration is made and approved by the Director, the Permittee may suspend groundwater monitoring actions.

XI.L.3.b If a successful demonstration is not made, the Permittee shall continue monitoring as required under 9 VAC 20-80-300.B.3.

XI.M MODULE ATTACHMENTS

As required under 9 VAC 20-80-520.C, the Permittee must have an Operations Plan that includes detailed instructions concerning groundwater monitoring [9 VAC 20-80-520.C.2.a]. These detailed groundwater monitoring instructions must at a minimum cover the items listed under 9 VAC 20-80-300.A.4.a. The document containing these instructions, called the *Groundwater Monitoring Plan*, shall be attached as Attachment X-1 to this Module.

It shall be the responsibility of the Permittee to update this Plan as needed, which may include a Permit amendment action as defined under 9 VAC 20-80-620.A – F, if changes to the monitoring program have taken place since original Plan development. The Permittee shall update the existing plan if applicable under 9 VAC 20-80-300.B.3.d.(4).(a - c) including any related amendment actions unless the condition under 9 VAC 20-80-300.B.3.d.(4).(d) is found applicable.

XI.M LIMITATIONS

Solid waste shall not be deposited in or permitted to enter any surface waters or groundwater. [9 VAC 20-80-250.C.10]

The groundwater monitoring and reporting requirements set forth here are minimum requirements. The Director may require, by amending the Permit, any owner or operator to install, operate, and maintain a groundwater monitoring system and program that contains requirements more stringent than those of the Regulations whenever it is determined that such requirements are necessary to prevent significant adverse effects on public health or the environment. [9 VAC 20-80-300.A.2.c]

Should information contained in any Permittee authored attachment to this Module conflict with any requirement or condition contained herein, or language found within 9 VAC 20-80-10 et seq.**,** as amended; the Module condition and/or Regulatory requirement shall prevail over the language in the Permittee supplied attachment **[**see 9 VAC 20-80-60.D and 550.E] unless it can be demonstrated that a Variance from that regulatory requirement has been granted by the Director under 9 VAC 20-80-730 et seq.

When the Permittee recognizes a failure to submit any relevant facts or has submitted incorrect information in any groundwater monitoring report to the Director, he shall, within 7-days, promptly submitted such omitted facts or the correct information with a full explanation. [9 VAC 20-80-570.E]

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MODULES XII and XIII
Closure/Post-Closure

ATTACHMENT XII-1
Landfill Closure Plan

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CLOSURE PLAN

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Prepared by:

HDR Engineering, Inc.

August 2008
Revised February 2009
Revised February 2010
Revised December 2010

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LIST OF TABLES

APPENDIX

A Worksheets for Estimation of Closure Costs

SECTION 1.0

LANDFILL CLOSURE PLAN

This Closure Plan (Plan) has been developed in accordance with 9 VAC 20-80-250.E. Its purpose is to provide a detailed closure plan for the Regional Landfill (Landfill) at any time during its active life or at the time of its scheduled closure. The Landfill will be closed in a manner that minimizes the need for further maintenance and controls; minimizes or eliminates, to the extent necessary to protect human health and the environment, the post-closure escape of uncontrolled leachate, surface run-off, or waste decomposition products to the groundwater and surface water; minimizes decomposition gas migration to the atmosphere.

SECTION 2.0

CLOSURE PERFORMANCE STANDARD

The closure of the Landfill will minimize the need for post-closure maintenance, and minimizes releases of waste or waste decomposition products by the installation of a final cover system that will:

- result in reduced leachate quantities over time;
- promote good surface drainage;
- resist erosion;
- restrict landfill gas migration;
- separate waste from vectors; and
- improve aesthetics.

In addition, decomposition gases that can destroy vegetative cover will be controlled.

SECTION 3.0
INVENTORY REMOVAL AND DISPOSAL

Waste disposed of at the Landfill will be left in place at closure of the facility and a final cover system will be installed. After cessation of all waste disposal, all equipment used in contact with waste will be decontaminated using appropriate detergents or solvents.

All liquid wastes generated from decontamination of equipment will be collected and disposed of in the appropriate manner. All contaminated subsoils, structures, and equipment contaminated with waste and leachate will be sampled and tested to verify decontamination.

3.1 SAMPLE COLLECTION AND ANALYSIS

3.1.1 Aqueous Samples

Aqueous samples will be collected in the immediate area of each identified possible pathway, as well as in a "clean" area for determination of background. Samples will be collected using the following procedure.

- Vacuum/sweep clean the area to remove loose residue or debris.
- Thoroughly rinse the identified area with plain water only, using a high-pressure hose or steam-cleaning machine. All liquid rinse waste will be collected in a wet/dry vacuum or other similar equipment.
- Take the appropriate sample amounts directly from the wet/dry vacuum by means of an uncontaminated glass or Teflon beaker and place directly into prepared sample containers. The container is not to be overfilled. Once properly filled and capped, the container will be inverted to mix the preservative and sample, and then placed into a zip-lock bag. The laboratory performing the analyses will provide the appropriate sample containers, pre-labeled with the analysis to be performed, and with preservatives added as necessary.
- Properly dispose of any remaining liquid waste.
- When sampling is complete, place the samples in an iced container for transport to the testing laboratory.

3.1.2 Soil Sampling and Analysis

Although the leachate aeration lagoons are lined, there is a possibility that they might possess or acquire leaks. In this case, surface soil samples near the lagoons will be collected and analyzed in order to determine whether an identified pathway has led to contamination of the site. Sample locations will be strategically located in order to collect a representative fraction of the soils with the minimum number of samples and effort. Locations will be selected so that samples are collected above and below the release point of the potential contamination pathway. Results from samples collected above the release point will be used to determine background quality for comparison with results of samples collected below the release point.

If sampling locations have established vegetative cover, it is necessary to remove and stockpile this cover. To accomplish this, a clean stainless steel shovel will be used to carefully dig up the turf so that it may be replaced upon completion of sampling. Once the soil sample is obtained, the soil will be placed in a glass container for mixing and then placed into a sample container. Once the sample has been collected, the turf will be replaced and tamped. The following outlines the actions necessary for surface soil collection; however, sampling techniques will be confirmed with a certified testing laboratory.

- Remove all surface debris with a clean stainless steel spoon or shovel. Carefully remove and save any vegetative cover.
- Using a precleaned stainless steel scoop or spoon, collect the surface soil sample and place it into a glass or Teflon coated stainless steel pan for mixing.
- Thoroughly mix the sample with a stainless steel spoon.
- Place the soil in the prepared sample container.
- When sampling is complete, place the samples in an iced container for transport to the testing laboratory.

3.2 CHAIN-OF-CUSTODY PROGRAM

A chain-of-custody program will be used to provide for tracing of individual samples from the time of the field-sampling event through laboratory analysis. Items included in this program consist of sample labels, sample seals, field logbook, and chain-of-custody record.

3.2.1 Sample Labels

Labels for each sample will contain a minimum of the following information:

- sample number;
- date and time of collection;
- location; and
- name of collector.

3.2.2 Sample Seal

To ensure that samples are not disturbed during shipment, a seal will be placed on individual containers or the entire package.

3.2.3 Field Log Book

All observations and field activities are to be recorded in a project dedicated logbook.

3.2.4 Chain-of-Custody

Each sample is to be documented on a chain-of-custody form. The following information is to be recorded on the form:

- project number;
- project name;
- sampler's signature;
- sampling location, date and time of sample collection, sample designation, and a brief description of the type of sample;
- total number of sample containers; and
- all transfers of the container.

3.3 SAMPLE ANALYSIS PROCEDURES

The following is a list of sampling parameters along with the appropriate test method in accordance with the United States Environmental Protection Agency (USEPA) document Test Methods for Evaluating Solid Waste Physical/Chemical Methods SW-846.

Table 3-1
Sampling Parameter Test Methods

Parameter	Approved Test Method
Arsenic	7060
Barium	7080
Cadmium	7130
Chromium	7190
Lead	7420
Mercury	7470
Selenium	7740
Silver	7760
Total Organic Carbon	8060
Total Organic Halides	9020

If ground water wells surrounding the leachate lagoons have detected contaminants, samples of undisturbed soil will be taken from on-site areas that are isolated from any possible sources of contamination and tested to determine the background concentrations. Additional samples will be taken surrounding the lagoons and will be tested. Once these laboratory results are available, parameter concentrations for each possible pathway are compared to the background concentrations to determine whether or not an impact has occurred.

If no impact is detected in both the aqueous and soil samples, it can be assumed that no contamination has occurred, and no further actions are necessary.

If an impact is detected in the aqueous sample, but not in the soil sample, it can be assumed that the contamination is localized in the vicinity of the pathway and cleanup of the pathway is required. Cleanup of the identified pathway will consist of watering the area with a high- pressure hose or steam-cleaning machine using a non-phosphorous detergent. The area will then be rinsed thoroughly with plain water and be allowed to dry. Once dry, the area will be resampled as described in this section.

This procedure will be repeated until the laboratory results from the pathway sample indicate no impact when compared to background data.

SECTION 4.0

CLOSURE OF DISPOSAL UNITS

4.1 CLOSURE OF SURFACE IMPOUNDMENTS

After closure of the Landfill has been achieved, the generation of leachate will reduce over time. When the flow rates have dropped adequately, future leachate may be managed through use of a portable tank system so that the lagoons can be decommissioned. The following procedures will be followed to properly close the leachate lagoons.

- Completely drain and remove all liquids, sludges, sediments, etc., from above the lagoon liner.
- Contain and sample all contents to determine proper disposal methods. Sampling methods and analyses shall be as approved by Virginia Department of Environmental Quality's (VDEQ) prior to commencement of closure activities.
- Remove and dispose of all formerly impounded contents as determined by the results of the analyses.
- Observe the condition of the synthetic liner for holes or defects. Cut and exhume the liner and examine the condition of underlying soils, giving particular attention to any areas beneath defects or holes, if any.
- Sample and analyze the soil using procedures outlined in Section 3.1.2 for appropriate constituents inherent to leachate. Assess the results for evidence of contaminant migration.
- If contamination of underlying soils is exhibited, perform an assessment as to the degree of contamination and develop remedial actions.
- Obtain approval from VDEQ for the assessment and associated remedial measures.
- Perform the remedial actions as necessary to limit any threats to public health and the environment.
- Restore the area to closely match pre-existing conditions in the vicinity of the impoundment. Activities may include: filling, grading, top soiling, and seeding.

4.2 COVER DESIGN

4.2.1 Description of Liners and Protective Material

The design of the proposed final cover is described from top to bottom as follows.

4.2.1.1 Cells I-IV

- A 6-inch erosion layer that is capable of sustaining native plant growth.
- An 18-inch vegetative support layer.
- A geocomposite drainage layer.
- An infiltration barrier layer comprised of a 40-mil liner.
- A 6- to 12-inch intermediate cover layer.

4.2.1.2 Cells V-VII

- A minimum of 6 inches of soil capable of supporting vegetation. This layer is the upper portion of the erosion control layer described in § 1.4.2.2 below to be resistant to erosion. Due to the use of a synthetic liner, the total soil thickness above the synthetic liner will be 2 feet. The remaining portions of the erosion layer will be an 18-inch layer of fill to facilitate moisture storage and root growth, along with a geocomposite drainage layer which is capable of reducing the head on the synthetic liner and facilitating free-drainage.
- The infiltration layer will be comprised of a 40-mil flexible textured membrane liner (FML) underlain by an 18-inch thick soil layer with a permeability no greater than $1x10^{-5}$ cm/sec. Depending on the sequence of construction, the soil portion of the infiltration layer may include the top six inches of intermediate cover in place if the material meets the project specifications regarding soil classification, gradation and hydraulic conductivity. If the top 6 inches of intermediate cover is utilized, it will be reworked and tested prior to additional lifts.

4.2.2 Erosion Control Layer

Erosion of the final cover will be minimized by the use of an erosion layer that contains a minimum of 6 inches of earthen material that is capable of sustaining native plant growth. The cap will be placed as various areas of the Landfill reach the permitted contours. The cap will be continuous, with no open seams, holes, or cracks.

The material of the erosion layer will be selected considering: soil type, nutrient levels, pH, erodibility, and other factors. When necessary, the erosion layer may require amending to establish vegetation. The vegetation should be selected based upon:

- species of grasses that are locally adapted and resistant to drought or temperature extremes;
- having roots that will not disrupt the low permeability layer;
- ability to thrive in low nutrient soil and develop a good stand to resist erosion; and
- ability to survive and function with little or no maintenance.

Finished sideslopes shall be stable and be configured to adequately control erosion and run-off. Sideslopes will include drainage features to minimize erosion potential in accordance with "Minimum Standards and Specification of the Virginia Erosion and Sediment Control Handbook (VESCH)." The final cover will be graded, seeded, and stabilized in accordance with the VESCH at the following pre-acre application rates or at rates established by a local seeder:

TABLE 4-1 FINAL COVER COMPOSITION	
Seed Type	Application Rate
Kentucky 31 Fescue	128 lbs.
Red Top Grass	2 lbs.
Seasonal Nurse Crop*	20 lbs.
Total	150 lbs.

* Use seasonal nurse crop in accordance with the seeding dates as stated below:

February through April	Annual Rye
May 1 through August	Foxtail Millet
September through November 15	Annual Rye
November 16 through January	Winter Rye

4.2.3 Final Slopes

The final grading plan for closure of Cells V, Vi, and VII of the Landfill are shown on Drawing C-09. These contours have been established to reflect all municipal solid waste (MSW) expected to be received, as well as placement of the intermediate cover material and the final cover system. The final slopes of the cover system will be 3H:1V maximum with a 20-foot wide bench every 40 vertical feet. The final contours have a minimum five percent grade above elevation 190 mean sea level (MSL).

In accordance with the USEPA Guidance Document (EPA/600/R-95-051), slope stability analyses were conducted for Cell VII. The EPA Guidance Document requires minimum factors of safety against slope failures of 1.5 statically and 1.0 dynamically for completed landfills. Since the Regional Landfill is not located within a seismic impact zone, dynamic stability analyses are not required. The computer program STABLSM was used to evaluate the slope stability of Cell VII of final build out. A critical cross-section located near the northwest corner of Cell VII was selected for analysis since this area represents maximum waste height and minimum natural ground elevations outside of the landfill footprint which should yield a minimum factor of safety. A generalized subsurface profile was developed for the stability analyses based on information obtained during the hydrogeological investigation for the Cell VII site.

Circular arc failure surfaces extending through the waste and into the foundation soils were evaluated for both drained and undrained soil conditions. Drained conditions represent long term conditions where pore pressures induced within clayey soils due to the waste loading have sufficient time to dissipate. Undrained conditions represent short term conditions where excess pore pressures do not have sufficient time to dissipate. A sliding block analysis was also performed to evaluate the potential for a failure surface to develop within the bottom liner system.

The minimum factors of safety obtained for the Cell VII stability analyses were 1.71 and 1.67 for the circular arc analyses under-drained and undrained conditions, respectively, and 1.53 for the sliding block analysis. The sliding block analysis assumed a minimum liner interface friction angle of 21 degrees, which is reflected in the specifications for the liner system. All factors of safety are satisfactory and meet USEPA guidelines. The global stability analyses are included in Module III A-2 of the Cell VII Part B Permit Application.

A stable final cover system requires adequate drainage to prevent the development of seepage forces within the soil cover which can lead to failure. In order to provide a stable final cover system, a geocomposite drainage layer was included in the design to adequate drainage. The minimum allowable transmissivity of the geocomposite drainage layer was specified based on the permeability of the vegetative support layer including the topsoil. The final cover geocomposite capacity calculations included in Permit Module III A-2 of the Cell VII Part B Permit Application demonstrate that the geocomposite must have a minimum transmissivity of $1.7x10^{-3}$ m^2/sec, which is readily attainable using products currently on the market. However, during construction, transmissivity and permeability tests will be performed on a periodic basis to ensure the proper combination of soil and geocomposite to prevent seepage forces from developing within the final cover soils which can ultimately result in cover veneer failure.

A cover veneer stability analysis was conducted to determine the minimum interface friction angle required for the final cover system. The analysis performed for the final slope of 33 percent (3H:1V) resulted in a minimum friction angle of 25 degrees. Published information demonstrates that the proposed components of the final cover system can meet or exceed this minimum friction angle. However, during construction, interface friction angle tests will be performed utilizing the final cover system materials to ensure the stability of the cover system.

4.3 SETTLEMENT SUBSIDENCE AND DISPLACEMENT

Landfill compaction methods which include the use of steel-wheeled compaction equipment to spread and compact in layers, combined with an adequate number of passes over each layer of waste will reduce voids and minimize differential settlement. Proper placement of daily, intermediate, and final covers will reduce the moisture content of the waste prior to site closure and further reduce settlement. After closure, the height of the Landfill is estimated to decrease 6.8 percent (see Attachment III-2). This amount of post-closure settlement will not adversely affect he performance of the final cover system.

The ability of the final cover system to withstand the anticipated maximum amount of settlement is dependent on the drainage layer. As the side slopes settle and become flatter, the potential for increased head on the geomembrane becomes greater. The refuse settlement calculations indicate that the final cover sideslope will only be reduced from 3H:1V to 3.2H:1V. The final cover geocomposite capacity calculations indicate an overall factor of safety of 2.0 was used to calculate the require transmissivity of the geocomposite, therefore adequate post-settlement drainage capacity will be provided. Saturation of the vegetative soil layer on the five percent top-slope is not considered a stability issue (due to minimum driving forces on the relatively flat top area), thus the function of the composite is not an issue.

4.4 FREEZE/THAW EFFECTS

According to the USEPA, document EPA530-R-93-017, November 1993, Figure 6-4, "Regional Depth of Frost Penetration in Inches", the average depth that frost will penetrate the soil in southeastern Virginia is 3 inches. Because the minimum thickness of the soil cover of the final cover system is 2 feet, freeze/thaw cycles are not expected to impact the integrity of the system.

SECTION 5.0
GROUNDWATER MONITORING SYSTEM

Groundwater-monitoring wells are sampled and analyzed for the parameters in Table 5.5 of VSWMR. Current and future groundwater monitoring requirements have been detailed in depth in the groundwater-monitoring plan. The plan includes information concerning monitoring well locations, specifications, and installation; sampling procedures and quality control; and description of the methods of analysis.

In addition to groundwater monitoring, surface water conditions are also monitored. At two points on the perimeter of the Landfill, surface water is sampled quarterly and analyzed for pH, BOD, and total suspended solids.

Details of the surface and groundwater monitoring protocol may be found in Permit Module X.

SECTION 6.0

LEACHATE COLLECTION SYSTEM

Collection and removal of leachate generated from waste within Cells I-VI and proposed Cell VII is accomplished by a system of perforated pipes installed with gravel-filled trenches beneath a sand drainage layer atop the liner system. The perforated pipes and trenches direct leachate by gravity to sumps within the cells. The sumps within Cells I-IV gravity drain to manholes along the east and west sides of the landfill, which subsequently drain to the leachate lagoons on-site. Cells V and VI have four sumps each with submersible-type leachate pumps while proposed Cell VII will have five sumps with submersible-type leachate pumps. These pumps transfer leachate via HDPE piping (forcemain) to the existing Cell V Pump Station and/or a proposed pump station. The leachate is then pumped to the on-site aeration lagoon before it is pumped via force main to the municipal wastewater treatment facility for final treatment (refer to § 6.1 of the Operations Manual).

SECTION 7.0
GAS COLLECTION SYSTEM

The existing gas collection and control system was designed to be in compliance with both the New Source Performance Standards and the Virginia Administrative Code encompassing all regulations for decomposition gases from municipal solid waste landfills.

Currently, landfill gas is extracted from Cells I through IV and Cell V through the installation of 131 vertical extraction wells. 77 vertical extraction wells are located on Cells I through IV with 54 vertical extraction wells installed in Cell V. In conjunction with these vertical extraction wells 29 leachate collection system manholes are connected to the gas collection system. These leachate collection system manholes were connected to the active gas collection system due to the significant quantities of landfill gas which were escaping through the system. Once connected, the pressure of landfill gas within the system was reduced. The valves for these connections are currently monitored daily to ensure that liquids and pressure do not accumulate in either the landfill gas collection system or the leachate collection system respectively.

Cell V currently has 54 vertical extraction wells. The leachate collection system is not connected to the active landfill gas extraction system. The vertical landfill gas extraction wells currently operate in all areas of Cell V which require NSPS compliance. In time, the vertical well collection system will be expanded into both Cell VI and VII. This will ensure that the landfill is kept in compliance with regulatory procedures.

For areas of the landfill which have undergone or will undergo final closure, well boots are installed. These well boots allow the effective penetration of the vertical extraction well through the geosynthetic final cover while still ensuring that the cover integrity is maintained along with reducing the risk of air intrusion and a potential subsurface combustion. The collected gas is processed into energy at the on-site gas plant operated by a third party. Should any of the collection wells require replacement, the final cover system shall be repaired as necessary (refer to § 6.2 of the Operations Manual). The final gas collection pipe network will be located above the geosynthetic liner. This will include all header and lateral piping for transmission of the landfill gas to the gas plant.

The Landfill Gas management Plan contained in Module II Attachment II-2 contains additional information pertaining to the Regional Landfill gas collection system including proposed extraction well and gas monitoring probe locations for Cell VII.

SECTION 8.0
SCHEDULE FOR CLOSURE

The following sections discuss closure of the various areas of the Landfill.

8.1 CELLS I-IV

Cells I-IV are no longer accepting waste. Closure construction was completed in May 2009. The post-closure care period began on September 21, 2009.

8.2 CELLS V-VII

8.2.1 Cells V-VI

Life projections were determined using the 12-month rolling average disposal rate for MSW and ash of 102,100 tpm and an average effective density of 1,540 pounds per cubic yard (lb/cy) as reported in the February 2008 SPSA Regional Landfill Cell VI Airspace Management Report. Based on an available operating airspace volume remaining of 7,292,881 cubic yards (CY), average landfill tonnages, and average effective density, the life of Cells V-VI will extend approximately 54 months or June 2012.

8.2.2 Cell VII

The total airspace volume of Cell VII, which includes refuse, daily and intermediate cover soil, and the final cover system, is approximately 10,818,100 CY. Utilizing the same factors for Cells V-VI, Cell VII is anticipated to have a site life of about 82 months or 6.8 years. As Cells V-VII will form one contiguous landfill unit, closure will occur in phases upon achieving final grades. The closure schedule for Cells V-VII is presented in Drawings C-06 through C-08.

8.3 CLOSURE COMPLETION

The following procedures will be implemented following closure of the Landfill.

- A signed certification from an independent registered professional engineer verifying that closure has been completed in accordance with the closure plan will be submitted to the VDEQ.
- At least one sign will be posted notifying all persons of the closing of the facility and that wastes are no longer accepted at the Landfill. Suitable barriers will be installed as necessary at former accesses to prevent new waste from being deposited. Locks, vehicular gates, and fencing will be replaced if functioning improperly. Warning signs will be kept legible at all times and will be replaced if damaged by inclement weather or vandalism.
- Within 90 days, a survey plat, prepared by a professional land surveyor registered by the Commonwealth, indicating the location and dimensions of landfill disposal areas, will be submitted to the Circuit Court Clerk of the City of Suffolk.

- A notation shall be recorded on the deed notifying any potential purchaser of the property that the land has been used as a solid waste management facility and that future use is restricted under 9 VAC 20-80-250.F.4.C. A copy of the deed notation as recorded shall be filed with the VDEQ. The language to be used shall be in general accordance with the following:

  To comply with 9 Virginia Admin. Code 20-80-250, SPSA hereby declared, covenants and agrees, for itself and its successors and assigns, for the sole benefit of the Virginia Department of Environmental Quality ("DEQ") and its successors in interest, that Cells __ through __ shall be hereafter held, leased, transferred and sold subject to the conditions and restrictions set forth below which shall run with the land and be binding on all parties and persons claiming under them pursuant to the terms of this Declaration

  1. Notice to Potential Purchasers. Pursuant to 9 Virginia Admin. Code 20-80-250(E)(5)(d)(3), this Declaration constitutes notice to any potential purchaser of the Property that Cells __ through __ have been used to manage solid waste.
  2. Restrictions on Use of Cells __ through __.
     a. In order to comply with 9 Virginia Admin. Code 20-80-250(E)(5)(d)(3) Cells _ through _ shall not be used in a manner that will disturb the integrity of the final cover, liners, or any other components of the containment system, or the function of the monitoring systems of Cells __ through __ unless necessary to comply with the requirements of 9 Virginia Admin. Code 20-80-250 or otherwise approved in advance by SPSA and the director of the DEQ (the "Director") pursuant to 9 Virginia Admin. Code 20-80-250(F)(4)(c).
     b. The restrictions on use of Cells __ through __ described in Section 2(a) above shall burden Cells __ through __ from the date of this Declaration until the date that is thirty (30) years after the date of closure of Cells __ through __, unless such date is otherwise modified by the Director pursuant to 9 Virginia Admin. Code 20-80-250(F)(3).

8.4 MILESTONE ACTIVITIES

Table 8.1 provides a breakdown of the closure schedule to allow tracking of intervening milestones.

TABLE 8-1
CLOSURE SCHEDULE MILESTONE ACTIVITIES

Milestone	Time Initiated[1]	Time Completed
Pre-Closure		
Posting of sign at the Landfill and notification of users and VDEQ of landfill closing date.	30 days prior	1 month
Closure		
Final waste acceptance.	Day 0	N/A
Site baited for rodent and vector control.	20 days	10 days
Final grading.	30 days	2 months
Installation of final cap.	90 days	2 months
Final seeding for vegetative cover.	150 days	1 week
Groundwater monitoring.	150 days	Semiannually for 30 years
Landfill gas monitoring.	150 days	Quarterly for 30 years
Final inspection.	175 days	Daily for 5 days
Final access control - posting of final closure sign.	180 days	1 day
Post-Closure		
VDEQ provided with certification from engineer closure completed in accordance with closure plan.	270 days	1 month
Survey plat submitted to Circuit Court Clerk - City of Suffolk.	270 days	1 month
Notation recorded on deed.	270 days	1 month
VDEQ provided engineers certification that post-closure care has been completed in accordance with post-closure plan.	30 years	1 month

(1) All time periods are relative to final date of waste acceptance.

SECTION 9.0

NOTICE OF FACILITY CLOSURE AND DATE OF FINAL WASTE ACCEPTANCE

A sign indicating the anticipated date of facility closure and the date of final waste acceptance will be conspicuously posted at the facility at least 30 days in advance. SPSA may also take other steps to notify the public of the planned closure, which may include advertising in the local newspaper and contacting regular users of the Landfill by mail. Additionally, the VDEQ will be notified of SPSA's intent to close the facility, and an amended closure plan will be submitted if required.

SECTION 10.0

NOTIFICATION

Within 90 days of closure completion, a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia will be submitted to the Circuit Court Clerk of the City of Suffolk. The following information shall be prominently displayed on the survey:

- location and dimensions of landfill disposal areas;
- monitoring well locations and identification numbers;
- a statement that SPSA is obligated by law to restrict the use and disturbance of the site to protect the integrity of the final cover system;
- a statement that this land has been used to manage solid waste; and
- a listing of the proposed uses during the post-closure period.

Special steps will be taken to assure that no waste will be placed at the Landfill after the site has been closed, including locking the site access gates and posting signs stating that the Landfill is no longer in operation.

SECTION 11.0
CLOSURE COST ESTIMATE

An estimate has been prepared to determine the approximate cost to achieve closure at the site. Tables 11.1 through 11.3 present a summary of closure costs for Cells V-VI, Cell VII Phase 1, and Cell VII Phase 2 respectively. Detailed worksheets of the necessary construction items, associated quantities, and unit costs are included in Appendix A. The costs represent current 2008 dollars and will require inflationary adjustments or other modifications to be consistent with future conditions. The unit costs are based on recent bids taken at the Landfill, and the cost estimate has been reformatted to reflect VDEQ recommendations for cost reporting.

TABLE 11-1
CLOSURE COSTS CELLS V-VI

Engineering Opinion of Probable Closure Construction Costs
SPSA Regional Landfill Cells V-VI (85.2 AC)

Item Description		Quantity	Unit	Unit Price	Total
I.	Native Soil for Slope and Fill	206,184	CY	$7.00	$1,443,300
II.	Topsoil	68,728	CY	$21.00	$1,443,300
III.	Drainage Layer	0	CY	0	$0
IV.	On-Site Clay	0	CY	0	$0
V.	Off-site Clay	206,184	CY	$13.00	$2,680,400
VI.	Drainage Tile	21,300	LF	$2.00	$42,600
VII.	Synthetic Membrane	3,711,312	SF	$0.38	$1,410,300
VIII.	Geotextile Filter Fabric	0	SF	0	$0
VIII.-a	Geonet Composite	3,711,312	SF	$0.51	$1,892,800
VIII.-b	Geosynthetic Clay Liner	0	SF	0	$0
IX.	Soil Admixture	0	SY	0	$0
X.	Protective Soil Cover (applicable for CDD landfills only)	0	CY	0	$0
XI.	Soil Testing	85.2	AC	$3,800.00	$323,800
XII.	Vegetative Cover	85.2	AC	$2,000.00	$170,400
XIII.	Landfill Gas (LFG) Management System	0	AC	0	$0
XIV.	Groundwater Monitoring System	0	AC	0	$0
	Total Unadjusted Closure Costs				$9,406,800
	City Cost Index			1	
	Total Adjusted Closure Costs				$9,406,800
XV.	Mobilization/Demobilization	1	LS	$453,600.00	$453,600
XVI.	Survey and Deed Notation	1	LS	$196,000.00	$196,000
XVII.	Closure Certification	1	LS	$10,000.00	$10,000
XVIII.-a	Erosion Control	1	LS	$403,000.00	$403,000
XVIII.-b	Storm Water Control	1	LS	$871,300.00	$871,300
	CLOSURE COST ESTIMATE SUBTOTAL				$11,340,700
	Contingency (10%)				$1,134,100
	Construction Documents (5%)				$567,000
	Construction Quality Assurance (10%)				$1,134,100
	TOTAL CLOSURE COST	85.2	AC	$166,383	**$14,175,800**

Notes:

1. Totals are rounded to nearest hundred.
2. This cost estimate assumes that a gas processing facility has been constructed and only the gas collection piping will be installed during closure.
3. City Cost Index was selected to be 1 as unit costs are based on local and current costs.

TABLE 11-2
CLOSURE COSTS CELL VII PHASE 1

Engineering Opinion of Probable Closure Construction Costs
SPSA Regional Landfill Cell VII - Phase 1 (30.8 AC)

Item Description		Quantity	Unit	Unit Price	Total
I.	Native Soil for Slope and Fill	74,536	CY	$7.00	$521,800
II.	Topsoil	24,845	CY	$21.00	$521,800
III.	Drainage Layer	0	CY	0	$0
IV.	On-Site Clay	0	CY	0	$0
V.	Off-site Clay	74,536	CY	$9.00	$670,800
VI.	Drainage Tile	5,950	LF	$25.00	$148,800
VII.	Synthetic Membrane	1,341,648	SF	$0.36	$483,000
VIII.	Geotextile Filter Fabric	0	SF	0	$0
VIII.-a	Geonet Composite	1,341,648	SF	$0.51	$684,200
VIII.-b	Geosynthetic Clay Liner	0	SF	0	$0
IX.	Soil Admixture	0	SY	0	$0
X.	Protective Soil Cover (applicable for CDD landfills only)	0	CY	0	$0
XI.	Soil Testing	30.8	AC	$1,200.00	$37,000
XII.	Vegetative Cover	30.8	AC	$3,800.00	$117,000
XIII.	Landfill Gas (LFG) Management System	30.8	AC	$5,354.22	$164,900
XIV.	Groundwater Monitoring System	0	AC	0	$0
	Total Unadjusted Closure Costs				$3,349,200
	City Cost Index			1	
	Total Adjusted Closure Costs				$3,349,200
XV.	Mobilization/Demobilization	1	LS	$300,000.00	$300,000
XVI.	Survey and Deed Notation	1	LS	$86,100.00	$86,100
XVII.	Closure Certification	1	LS	$10,000.00	$10,000
XVIII.-a	Erosion Control	1	LS	$150,000.00	$150,000
XVIII.-b	Storm Water Control	1	LS	$380,600.00	$380,600
	CLOSURE COST ESTIMATE SUBTOTAL				$4,275,900
	Contingency (10%)				$427,600
	Construction Documents (5%)				$213,800
	Construction Quality Assurance (10%)				$427,600
	TOTAL CLOSURE COST	30.8	AC	$173,534	**$5,344,800**

Notes:

1. Totals are rounded to nearest hundred.
2. This cost estimate assumes that a gas processing facility has been constructed and only the gas collection piping will be installed during closure.
3. All quantities are estimated and should be revised prior to construction.
4. City Cost Index was selected to be 1 as unit costs are based on local and current costs.
5. A detailed breakdown of costs is included in Appendix A.

TABLE 11-3
CLOSURE COSTS CELL VII PHASE 2

Engineering Opinion of Probable Closure Construction Costs
SPSA Regional Landfill Cell VII - Phase 2 (25.3 AC)

Item Description		Quantity	Unit	Unit Price	Total
I.	Native Soil for Slope and Fill	61,226	CY	$7.00	$428,600
II.	Topsoil	20,409	CY	$21.00	$428,600
III.	Drainage Layer	0	CY	0	$0
IV.	On-Site Clay	0	CY	0	$0
V.	Off-site Clay	61,226	CY	$9.00	$551,000
VI.	Drainage Tile	10,350	LF	$25.00	$258,800
VII.	Synthetic Membrane	1,102,068	SF	$0.36	$396,700
VIII.	Geotextile Filter Fabric	0	SF	0	$0
VIII.-a	Geonet Composite	1,102,068	SF	$0.51	$562,100
VIII.-b	Geosynthetic Clay Liner	0	SF	0	$0
IX.	Soil Admixture	0	SY	0	$0
X.	Protective Soil Cover (applicable for CDD landfills only)	0	CY	0	$0
XI.	Soil Testing	25.3	AC	$1,200.00	$30,400
XII.	Vegetative Cover	25.3	AC	$2,000.00	$50,600
XIII.	Landfill Gas (LFG) Management System	25.3	AC	$5,431.23	$137,400
XIV.	Groundwater Monitoring System	0	AC	0	$0
	Total Unadjusted Closure Costs				$2,844,100
	City Cost Index			1	
	Total Adjusted Closure Costs				$2,844,100
XV.	Mobilization/Demobilization	1	LS	$300,000.00	$300,000
XVI.	Survey and Deed Notation	1	LS	$86,100.00	$86,100
XVII.	Closure Certification	1	LS	$10,000.00	$10,000
XVIII.-a	Erosion Control	1	LS	$150,000.00	$150,000
XVIII.-b	Storm Water Control	1	LS	$164,900.00	$164,900
	CLOSURE COST ESTIMATE SUBTOTAL				$3,555,000
	Contingency (10%)				$355,500
	Construction Documents (5%)				$177,800
	Construction Quality Assurance (10%)				$355,500
	TOTAL CLOSURE COST	25.3	AC	$175,644	**$4,443,800**

Notes:

1. Totals are rounded to nearest hundred.
2. This cost estimate assumes that a gas processing facility has been constructed and only the gas collection piping will be installed during closure.
3. All quantities are estimated and should be revised prior to construction.
4. City Cost Index was selected to be 1 as unit costs are based on local and current costs.
5. A detailed breakdown of costs is included in Appendix A.

APPENDIX A

Worksheets for Estimation of Closure Costs:

Cells V-VI

Cells VII Phase 1

VII Phase 2

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Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELLS V-VI

Facility Name: SPSA Regional Landfill - Cells V-VI
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434

Facility Owner: Southeastern Public Service Authority
OPM Representative Completing Format: HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills: Closure Costs - all sections except Section X
Post Closure - Post-Closure - all sections
CDD Landfills: Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII
Post Closure - Post-Closure - all sections

I. NATIVE SOIL FOR SLOPE AND FILL

			Notes and Guidance Values		
a.	Area to be capped	85.2	acres x 4840 yd2/acre=	412368	yd2
b.	Depth of native soil for slope and fill	18	inches x 1yd/36in=	0.50	yd
c.	Quantity of native soil needed		a x b	206184	yd3
d.	Percentage of soil from off-site	100%	%	100%	
e.	Purchase Unit cost off-site material (to include delivery cost)	$4.63	per yd3	$4.63	/yd3
f.	Percentage of soil from on-site	0%	(1 - d)	0%	
g.	Excavation unit cost (on-site material)	$0.00	per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$4.63	
i.	Placement and Spreading Unit Cost	$2.00	per yd3	$2.00	per yd3
j.	Compaction unit cost	$0.37	per yd3	$0.37	per yd3
k.	Total soil unit cost		(h + I + j)	$7.00	/yd3
l.	Total native soil cost			$1,443,288.00	
m.	Percent compaction	0%		0%	
0	*Total Native Soil Cost*		*(h) x (1 + l)*	***$1,443,288***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELLS V-VI

II. TOPSOIL

a.	Area to be capped	85.2	acres x 4840 yd2/acre	412368	yd2
b.	Depth of topsoil needed	6	in x 0.028 yd/in	0.17	yd
c.	Quantity of topsoil needed		a x b	68728	yd3
d.	Percentage of soil from off-site	100%	%	100%	
e.	Purchase Unit cost off-site material (to include delivery cost)	$18.63	per yd3	$18.63	/yd3
f.	Percentage of soil from on-site	0%	(1 - d)	0%	
g.	Excavation unit cost (on-site material)		per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$18.63	
i.	Placement and Spreading Unit Cost	$2.00	per yd3	$2.00	per yd3
j.	Compaction unit cost	$0.37	per yd3	$0.37	per yd3
k.	Total soil unit cost		(h + I + j)	$21.00	/yd3
l.	Total soil cost			$1,443,288.00	
m.	Percent compaction	0%		0%	
o	*Total Topsoil Cost*		*(h) x (1 + l)*	**$1,443,288**	

III. DRAINAGE LAYER

a.	Area to be capped	0	acres x 4840 yd2/acre	0	yd2
b.	Depth of sand or gravel needed		in x 0.028 yd/in	0	yd
c.	Quantity of sand or gravel needed		a x b	0	yd3
d.	Purchase unit cost for material or excavation cost		per yd3	$0.00	per yd3
e.	Delivery Cost (for delivery of off-site material; dependent upon haul distance)		per yd3	$0.00	per yd3
f.	Spreading unit cost for material		per yd3	$0.00	per yd3
g.	Compaction unit cost for material		per yd3	$0.00	per yd3
h.	Total material cost		(d + e + f + g)	$0.00	per yd3
i.	Percent compaction	25%	(%/100)	25%	
j	*Total Drainage Layer Cost*		*[c x h x (1 +i)]*	***$0***	

IV. ON-SITE CLAY

a.	Area to be capped		acres x 4840 yd2	0	yd2
b.	Depth of clay needed		in x (1/36)yd	0.00	yd
c.	Quantity of clay needed		a x b	0	yd3
d.	Excavation unit cost		per yd3	$0.00	per yd3
e.	Placement/spreading unit cost		per yd3	$0.00	per yd3
f.	Compaction unit cost		per yd3	$0.00	per yd3
g.	Total on-site clay unit cost		(d + e + f)	$0.00	per yds
h.	Percent compaction	25%	%/100	25%	
i.	*Total On-Site Clay Cost*		*[c x g x (1+h)]*	***$0***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELLS V-VI

V. OFF-SITE CLAY

a. Area to be capped	85.2	acres x 4840 yd2	412368	yd2
b. Depth of clay needed	18	in x (1/36)yd	0.5	yd
c. Quantity of clay needed		a x b	206184	yd3
d. Purchase unit cost	$6.00	per yd3	$6.00	per yd3
e. Delivery unit cost (for off-site material)	$4.00	per yd3	$4.00	per yd3
f. Placement/spreading unit cost	$2.00	per yd3	$2.00	per yd3
g. Compaction unit cost	$1.00	per yd3	$1.00	per yd3
h. Total off-site clay unit cost		(d + e + f + g)	$13.00	per yd3
i. Percent compaction	0%	%/100	0%	
j. Total Off-Site Clay Cost		*[c x h x (1 + i)]*	***$2,680,392***	

VI. DRAINAGE TILE

a. Length of drainage tile needed	21300	LF	21300	LF
b. Tile unit cost	$2.00	per LF	$2.00	per LF
c. Trenching and backfilling cost		per LF	$0.00	per LF
d. Total drainage tile unit cost		(b+c)	$2.00	per LF
e. Total Drainage Tile Cost		*(a x d)*	***$42,600***	

VII. SYNTHETIC MEMBRANE

a. Area to be capped with FML	85.2	acres x 43560 ft2/acre	3711312	ft2
b. Purchase unit cost		$0.20	$0.20	/ft2
c. Installation unit cost		$0.18	$0.18	/ft2
d. Total synthetic membrane unit cost		(b + c)	$0.38	/ft2
e. Total Synthetic Membrane Cost		*(a x d)*	***$1,410,299***	

VIII. GEOTEXTILE FILTER FABRIC

a. Quantity of filter fabric needed		acres x 43560 ft2/acre=	0	ft2
b. Purchase unit cost			$0.00	/ft2
c. Installation unit cost			$0.00	/ft2
d. Total geotextile filter fabric unit cost		(b + c)	$0.00	/ft2
e. Total Geotextile Filter Fabric Cost		*(a x d)*	***$0***	

VIII.-a GEONET COMPOSITE

a. Quantity of Geonet Composite needed	85.2	acres x 43560ft2/acre	3711312	ft2
b. Purchase Unit Cost		$0.36	$0.36	/ft2
c. Installation Unit Cost		$0.15	$0.15	/ft2
d. Total Geonet Composite unit cost		(b + c)	$0.51	/ft2
e Total Geonet Composite cost		*(a x d)*	***$1,892,769***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELLS V-VI

VIII.-b GEOSYNTHETIC CLAY LINER

a.	Quantity of liner needed		acres x 43560 ft2/acre	0	ft2
b.	Purchase unit cost			$0.00	/ft2
c.	Installation unit cost			$0.00	/ft2
d.	Total Clay Liner unit cost		(b + c)	$0.00	/ft2
e.	*Total clay liner cost*		*(a x d)*	***$0***	

IX. SOIL ADMIXTURE

a.	Area to be capped		acres x 4840 yd2	0	yd2
b.	Soil admixture unit cost		per yd2	$0.00	per yd2
c.	*Total Soil Admixture Cost*		*(a x b)*	***$0***	

X. PROTECTIVE SOIL COVER (applicable for CDD landfills only)

a.	Area to be capped		acres x 4840 yd2/acre	0	yd2
b.	Depth of soil needed		in x (1/36)yd	0.00	yd
c.	Quantity of soil needed		(a x b)	0	yd3
d.	Percentage of soil from off-site		%	0%	
e.	Purchase Unit cost off-site material (to include delivery cost)		per yd3	$0.00	/yd3
f.	Percentage of soil from on-site	100%	(1 - d)	100%	
g.	Excavation unit cost (on-site material)		per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$0.00	
i.	Placement and Spreading Unit Cost		per yd3	$0.00	per yd3
j.	Compaction unit cost		per yd3	$0.00	per yd3
k.	Total soil unit cost		(h + I + j)	$0.00	/yd3
l.	Total soil cost			$0.00	
m.	Percent compaction	0%		0%	
o	*Total Topsoil Cost*		*(h) x (1 + l)*	**$0**	

XI. SOIL TESTING

a.	Number of acres to be capped		85.2	85.2	acres
b.	Testing unit cost (includes permeability tests and technician)		$3,800	$3,800.00	per acre
c.	*Total Soil Testing Unit Cost*		*(a x b)*	***$323,760***	

XII. VEGETATIVE COVER

a.	Number of acres to be vegetated		85.2	85.2	acres
b.	Unit cost for soil preparation, grading, seed, and fertilizer		$2,000.00	$2,000.00	per acre
c.	*Total Vegetative Cover Cost*		*(a x b)*	***$170,400***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELLS V-VI

XIII. LANDFILL GAS (LFG) MANAGEMENT SYSTEM

a.	Number of acres of landfill to be closed		0	0	acres
b.	Number of LFG detection probes to be installed	5	(every 500' around cell)	5	wells
c.	Average number of LFG vents required per acre		1	1	vents
d.	Average cost per LFG vent		$5,000.00	$5,000.00	per vent
e.	Average LFG detection probe unit cost		$0.00	$0.00	per probe
f.	Total cost for LFG vents		(a x c x d)	$0.00	
g.	Total cost for LFG detection probes		(b x e)	$0.00	
h.	*Total Gas Management System Cost*		*(f + g)*	***$0***	

Sanitary Max. Spacing = 250 ft

CDD/Industrial Max. Spacing = 500 ft

XIV. GROUNDWATER MONITORING SYSTEM

a.	Hydrogeologic study unit cost (includes boring costs, piezometer costs, pump test costs, etc.)	$10,000 or as required		
b.	Monitoring well construction unit cost (includes installation and materials for a 50' deep well; minimum of four wells must be installed)		$0.00	per well
c.	Number of wells to be installed		0	wells
d.	Additional well length over 50'		0	LF
e.	Unit cost for additional well length over 50'		$0.00	per VLF
f.	Total additional cost for well length over 50'	(e x d)	$0.00	
g.	Total Monitoring Well Construction Cost	(b x c)	$0.00	
h.	*Total Groundwater Monitoring System Cost*	*(b x c) + (d x e)*	***$0.00***	

XV. MOBILIZATION/ DEMOBILIZATION

a.	*Cost for Mobilization/ Demobilization*	*$15,000 or as required*	**453,600**

XVI. SURVEY AND DEED NOTATION

a.	*Cost for Survey and Deed Notation*	*$2,000 or as required*	**195,960**

XVII. CLOSURE CERTIFICATION

a.	*Closure Certification Costs*	*$2,000 or as required*	**10,000**

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELLS V-VI

XVIII. MISCELLANEOUS COSTS TO CLOSE

a. Erosion Control	$15,000 or as required	**403,043**
b. Storm Water Control	$5,000 or as required	**871,260**
c. Total Miscellaneous Costs	*(a + b)*	***1,274,303***

TOTAL CONSTRUCTION CLOSURE COSTS

Total Unadjusted Closure Costs (TUCC)=

(I+II. . . XIV) ***$9,406,796***

City Cost Index (CCI) Appen B.=

1 = 100% ***1***

Total Adjusted Closure Costs (TACC)=

CCI x TUCC ***9,406,796***

Closure Cost Estimate Subtotal=

(TACC +XV. . . . XVIII) ***11,340,659***

Contingency (10%)=

(Subtotal x 0.1) ***1,134,066***

Engineering Fees=

Construction Documents(5% or as needed)	*(Subtotal x 0.05)*	***567,033***
Construction Quality Assurance (10% or as needed)	(Subtotal x 0.1)	***1,134,066***

Total Closure Cost=

(Subtotal +Contingency + Engineering) ***14,175,823***

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 1

Facility Name: SPSA Regional Landfill - Cell VII - Phase 1
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434

Facility Owner: Southeastern Public Service Authority
OPM Representative Completing Format: HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills: Closure Costs - all sections except Section X
Post Closure - Post-Closure - all sections
CDD Landfills: Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII
Post Closure - Post-Closure - all sections

I. NATIVE SOIL FOR SLOPE AND FILL

			Notes and Guidance Values		
a.	Area to be capped	30.8	acres x 4840 yd2/acre=	149072	yd2
b.	Depth of native soil for slope and fill	18	inches x 1yd/36in=	0.50	yd
c.	Quantity of native soil needed		a x b	74536	yd3
d.	Percentage of soil from off-site	100%	%	100%	
e.	Purchase Unit cost off-site material (to include delivery cost)	$4.63	per yd3	$4.63	/yd3
f.	Percentage of soil from on-site	0%	(1 - d)	0%	
g.	Excavation unit cost (on-site material)	$0.00	per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$4.63	
i.	Placement and Spreading Unit Cost	$2.00	per yd3	$2.00	per yd3
j.	Compaction unit cost	$0.37	per yd3	$0.37	per yd3
k.	Total soil unit cost		(h + I + j)	$7.00	/yd3
l.	Total native soil cost			$521,752.00	
m.	Percent compaction	0%		0%	
0	*Total Native Soil Cost*		*(h) x (1 + l)*	***$521,752***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 1

II. TOPSOIL

a.	Area to be capped	30.8	acres x 4840 yd2/acre	149072	yd2
b.	Depth of topsoil needed	6	in x 0.028 yd/in	0.17	yd
c.	Quantity of topsoil needed		a x b	24845	yd3
d.	Percentage of soil from off-site	100%	%	100%	
e.	Purchase Unit cost off-site material (to include delivery cost)	$18.63	per yd3	$18.63	/yd3
f.	Percentage of soil from on-site	0%	(1 - d)	0%	
g.	Excavation unit cost (on-site material)		per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$18.63	
i.	Placement and Spreading Unit Cost	$2.00	per yd3	$2.00	per yd3
j.	Compaction unit cost	$0.37	per yd3	$0.37	per yd3
k.	Total soil unit cost		(h + I + j)	$21.00	/yd3
l.	Total soil cost			$521,752.00	
m.	Percent compaction	0%		0%	
o	*Total Topsoil Cost*		*(h) x (1 + l)*	**$521,752**	

III. DRAINAGE LAYER

a.	Area to be capped	0	acres x 4840 yd2/acre	0	yd2
b.	Depth of sand or gravel needed		in x 0.028 yd/in	0	yd
c.	Quantity of sand or gravel needed		a x b	0	yd3
d.	Purchase unit cost for material or excavation cost		per yd3	$0.00	per yd3
e.	Delivery Cost (for delivery of off-site material; dependent upon haul distance)		per yd3	$0.00	per yd3
f.	Spreading unit cost for material		per yd3	$0.00	per yd3
g.	Compaction unit cost for material		per yd3	$0.00	per yd3
h.	Total material cost		(d + e + f + g)	$0.00	per yd3
i.	Percent compaction	0%	(%/100)	0%	
j	*Total Drainage Layer Cost*		*[c x h x (1 +i)]*	***$0***	

IV. ON-SITE CLAY

a.	Area to be capped		acres x 4840 yd2	0	yd2
b.	Depth of clay needed		in x (1/36)yd	0.00	yd
c.	Quantity of clay needed		a x b	0	yd3
d.	Excavation unit cost		per yd3	$0.00	per yd3
e.	Placement/spreading unit cost		per yd3	$0.00	per yd3
f.	Compaction unit cost		per yd3	$0.00	per yd3
g.	Total on-site clay unit cost		(d + e + f)	$0.00	per yds
h.	Percent compaction	0%	%/100	0%	
i.	*Total On-Site Clay Cost*		*[c x g x (1+h)]*	***$0***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 1

V. OFF-SITE CLAY

a. Area to be capped	30.8	acres x 4840 yd2	149072	yd2
b. Depth of clay needed	18	in x (1/36)yd	0.5	yd
c. Quantity of clay needed		a x b	74536	yd3
d. Purchase unit cost	$3.00	per yd3	$3.00	per yd3
e. Delivery unit cost (for off-site material)	$3.00	per yd3	$3.00	per yd3
f. Placement/spreading unit cost	$2.00	per yd3	$2.00	per yd3
g. Compaction unit cost	$1.00	per yd3	$1.00	per yd3
h. Total off-site clay unit cost		(d + e + f + g)	$9.00	per yd3
i. Percent compaction	0%	%/100	0%	
j. Total Off-Site Clay Cost		*[c x h x (1 + i)]*	***$670,824***	

VI. DRAINAGE TILE

a. Length of drainage tile needed	5950	LF	5950	LF
b. Tile unit cost	$25.00	per LF	$25.00	per LF
c. Trenching and backfilling cost		per LF	$0.00	per LF
d. Total drainage tile unit cost		(b+c)	$25.00	per LF
e. Total Drainage Tile Cost		*(a x d)*	***$148,750***	

VII. SYNTHETIC MEMBRANE

a. Area to be capped with FML	30.8	acres x 43560 ft2/acre	1341648	ft2
b. Purchase unit cost		$0.20	$0.20	/ft2
c. Installation unit cost		$0.16	$0.16	/ft2
d. Total synthetic membrane unit cost		(b + c)	$0.36	/ft2
e. Total Synthetic Membrane Cost		*(a x d)*	***$482,993***	

VIII. GEOTEXTILE FILTER FABRIC

a. Quantity of filter fabric needed		acres x 43560 ft2/acre=	0	ft2
b. Purchase unit cost			$0.00	/ft2
c. Installation unit cost			$0.00	/ft2
d. Total geotextile filter fabric unit cost		(b + c)	$0.00	/ft2
e. Total Geotextile Filter Fabric Cost		*(a x d)*	***$0***	

VIII.-a GEONET COMPOSITE

a. Quantity of Geonet Composite needed	30.8	acres x 43560ft2/acre	1341648	ft2
b. Purchase Unit Cost		$0.36	$0.36	/ft2
c. Installation Unit Cost		$0.15	$0.15	/ft2
d. Total Geonet Composite unit cost		(b + c)	$0.51	/ft2
e Total Geonet Composite cost		*(a x d)*	***$684,240***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 1

VIII.-b GEOSYNTHETIC CLAY LINER

a.	Quantity of liner needed		acres x 43560 ft2/acre	0	ft2
b.	Purchase unit cost			$0.00	/ft2
c.	Installation unit cost			$0.00	/ft2
d.	Total Clay Liner unit cost		(b + c)	$0.00	/ft2
e.	*Total clay liner cost*		*(a x d)*	**$0**	

IX. SOIL ADMIXTURE

a.	Area to be capped		acres x 4840 yd2	0	yd2
b.	Soil admixture unit cost		per yd2	$0.00	per yd2
c.	*Total Soil Admixture Cost*		*(a x b)*	**$0**	

X. PROTECTIVE SOIL COVER (applicable for CDD landfills only)

a.	Area to be capped		acres x 4840 yd2/acre	0	yd2
b.	Depth of soil needed		in x (1/36)yd	0.00	yd
c.	Quantity of soil needed		(a x b)	0	yd3
d.	Percentage of soil from off-site		%	0%	
e.	Purchase Unit cost off-site material (to include delivery cost)		per yd3	$0.00	/yd3
f.	Percentage of soil from on-site	100%	(1 - d)	100%	
g.	Excavation unit cost (on-site material)		per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$0.00	
i.	Placement and Spreading Unit Cost		per yd3	$0.00	per yd3
j.	Compaction unit cost		per yd3	$0.00	per yd3
k.	Total soil unit cost		(h + I + j)	$0.00	/yd3
l.	Total soil cost			$0.00	
m.	Percent compaction	0%		0%	
o	*Total Topsoil Cost*		*(h) x (1 + l)*	**$0**	

XI. SOIL TESTING

a.	Number of acres to be capped		30.8	30.8	acres
b.	Testing unit cost (includes permeability tests and technician)		$1,200	$1,200.00	per acre
c.	*Total Soil Testing Unit Cost*		*(a x b)*	***$36,960***	

XII. VEGETATIVE COVER

a.	Number of acres to be vegetated		30.8	30.8	acres
b.	Unit cost for soil preparation, grading, seed, and fertilizer		$3,800.00	$3,800.00	per acre
c.	*Total Vegetative Cover Cost*		*(a x b)*	***$117,040***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 1

XIII. LANDFILL GAS (LFG) MANAGEMENT SYSTEM

a.	Number of acres of landfill to be closed		30.8	30.8	acres
b.	Number of LFG detection probes to be installed	5	(every 500' around cell)	5	wells
c.	Average number of LFG vents required per acre		1	1	vents
d.	Average cost per LFG vent		$5,000.00	$5,000.00	per vent
e.	Average LFG detection probe unit cost		$2,182.00	$2,182.00	per probe
f.	Total cost for LFG vents		(a x c x d)	$154,000.00	
g.	Total cost for LFG detection probes		(b x e)	$10,910.00	
h.	*Total Gas Management System Cost*		*(f + g)*	***$164,910***	

Sanitary Max. Spacing = 250 ft

CDD/Industrial Max. Spacing = 500 ft

XIV. GROUNDWATER MONITORING SYSTEM

a.	Hydrogeologic study unit cost (includes boring costs, piezometer costs, pump test costs, etc.)	$10,000 or as required		
b.	Monitoring well construction unit cost (includes installation and materials for a 50' deep well; minimum of four wells must be installed)		$0.00	per well
c.	Number of wells to be installed		0	wells
d.	Additional well length over 50'		0	LF
e.	Unit cost for additional well length over 50'		$0.00	per VLF
f.	Total additional cost for well length over 50'	(e x d)	$0.00	
g.	Total Monitoring Well Construction Cost	(b x c)	$0.00	
h.	*Total Groundwater Monitoring System Cost*	*(b x c) + (d x e)*	***$0.00***	

XV. MOBILIZATION/ DEMOBILIZATION

a.	*Cost for Mobilization/ Demobilization*	*$15,000 or as required*	***300,000***

XVI. SURVEY AND DEED NOTATION

a.	*Cost for Survey and Deed Notation*	*$2,000 or as required*	***86,066***

XVII. CLOSURE CERTIFICATION

a.	*Closure Certification Costs*	*$2,000 or as required*	***10,000***

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 1

XVIII. MISCELLANEOUS COSTS TO CLOSE

a.	Erosion Control	$15,000 or as required	**150,000**
b.	Storm Water Control	$5,000 or as required	**380,585**
c.	*Total Miscellaneous Costs*	*(a + b)*	***530,585***

TOTAL CONSTRUCTION CLOSURE COSTS

Total Unadjusted Closure Costs (TUCC)=		
(I+II. . . XIV)		***$3,349,222***
City Cost Index (CCI) Appen B.=		
1 = 100%		***1***
Total Adjusted Closure Costs (TACC)=		
CCI x TUCC		***3,349,222***
Closure Cost Estimate Subtotal=		
(TACC +XV. . . . XVIII)		***4,275,872***
Contingency (10%)=		
(Subtotal x 0.1)		***427,587***
Engineering Fees=		
Construction Documents(5% or as needed)	*(Subtotal x 0.05)*	***213,794***
Construction Quality Assurance (10% or as needed)	(Subtotal x 0.1)	***427,587***
Total Closure Cost=		
(Subtotal +Contingency + Engineering)		***5,344,840***

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 2

Facility Name: SPSA Regional Landfill - Cell VII - Phase 2
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434

Facility Owner: Southeastern Public Service Authority
OPM Representative Completing Format: HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills: Closure Costs - all sections except Section X
Post Closure - Post-Closure - all sections
CDD Landfills: Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII
Post Closure - Post-Closure - all sections

I. NATIVE SOIL FOR SLOPE AND FILL

			Notes and Guidance Values		
a.	Area to be capped	25.3	acres x 4840 yd2/acre=	122452	yd2
b.	Depth of native soil for slope and fill	18	inches x 1yd/36in=	0.50	yd
c.	Quantity of native soil needed		a x b	61226	yd3
d.	Percentage of soil from off-site	100%	%	100%	
e.	Purchase Unit cost off-site material (to include delivery cost)	$4.63	per yd3	$4.63	/yd3
f.	Percentage of soil from on-site	0%	(1 - d)	0%	
g.	Excavation unit cost (on-site material)	$0.00	per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$4.63	
i.	Placement and Spreading Unit Cost	$2.00	per yd3	$2.00	per yd3
j.	Compaction unit cost	$0.37	per yd3	$0.37	per yd3
k.	Total soil unit cost		(h + I + j)	$7.00	/yd3
l.	Total native soil cost			$428,582.00	
m.	Percent compaction	0%		0%	
0	*Total Native Soil Cost*		*(h) x (1 + l)*	***$428,582***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 2

II. TOPSOIL

a.	Area to be capped	25.3	acres x 4840 yd2/acre	122452	yd2
b.	Depth of topsoil needed	6	in x 0.028 yd/in	0.17	yd
c.	Quantity of topsoil needed		a x b	20409	yd3
d.	Percentage of soil from off-site	100%	%	100%	
e.	Purchase Unit cost off-site material (to include delivery cost)	$18.63	per yd3	$18.63	/yd3
f.	Percentage of soil from on-site	0%	(1 - d)	0%	
g.	Excavation unit cost (on-site material)		per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$18.63	
i.	Placement and Spreading Unit Cost	$2.00	per yd3	$2.00	per yd3
j.	Compaction unit cost	$0.37	per yd3	$0.37	per yd3
k.	Total soil unit cost		(h + I + j)	$21.00	/yd3
l.	Total soil cost			$428,582.00	
m.	Percent compaction	0%		0%	
o	*Total Topsoil Cost*		*(h) x (1 + l)*	**$428,582**	

III. DRAINAGE LAYER

a.	Area to be capped	0	acres x 4840 yd2/acre	0	yd2
b.	Depth of sand or gravel needed		in x 0.028 yd/in	0	yd
c.	Quantity of sand or gravel needed		a x b	0	yd3
d.	Purchase unit cost for material or excavation cost		per yd3	$0.00	per yd3
e.	Delivery Cost (for delivery of off-site material; dependent upon haul distance)		per yd3	$0.00	per yd3
f.	Spreading unit cost for material		per yd3	$0.00	per yd3
g.	Compaction unit cost for material		per yd3	$0.00	per yd3
h.	Total material cost		(d + e + f + g)	$0.00	per yd3
i.	Percent compaction	0%	(%/100)	0%	
j	*Total Drainage Layer Cost*		*[c x h x (1 +i)]*	***$0***	

IV. ON-SITE CLAY

a.	Area to be capped		acres x 4840 yd2	0	yd2
b.	Depth of clay needed		in x (1/36)yd	0.00	yd
c.	Quantity of clay needed		a x b	0	yd3
d.	Excavation unit cost		per yd3	$0.00	per yd3
e.	Placement/spreading unit cost		per yd3	$0.00	per yd3
f.	Compaction unit cost		per yd3	$0.00	per yd3
g.	Total on-site clay unit cost		(d + e + f)	$0.00	per yds
h.	Percent compaction	0%	%/100	0%	
i.	*Total On-Site Clay Cost*		*[c x g x (1+h)]*	***$0***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 2

V. OFF-SITE CLAY

a. Area to be capped	25.3	acres x 4840 yd2	122452	yd2
b. Depth of clay needed	18	in x (1/36)yd	0.5	yd
c. Quantity of clay needed		a x b	61226	yd3
d. Purchase unit cost	$3.00	per yd3	$3.00	per yd3
e. Delivery unit cost (for off-site material)	$3.00	per yd3	$3.00	per yd3
f. Placement/spreading unit cost	$2.00	per yd3	$2.00	per yd3
g. Compaction unit cost	$1.00	per yd3	$1.00	per yd3
h. Total off-site clay unit cost		(d + e + f + g)	$9.00	per yd3
i. Percent compaction	0%	%/100	0%	
j. *Total Off-Site Clay Cost*		*[c x h x (1 + i)]*	***$551,034***	

VI. DRAINAGE TILE

a. Length of drainage tile needed	10350	LF	10350	LF
b. Tile unit cost	$25.00	per LF	$25.00	per LF
c. Trenching and backfilling cost		per LF	$0.00	per LF
d. Total drainage tile unit cost		(b+c)	$25.00	per LF
e. *Total Drainage Tile Cost*		*(a x d)*	***$258,750***	

VII. SYNTHETIC MEMBRANE

a. Area to be capped with FML	25.3	acres x 43560 ft2/acre	1102068	ft2
b. Purchase unit cost		$0.20	$0.20	/ft2
c. Installation unit cost		$0.16	$0.16	/ft2
d. Total synthetic membrane unit cost		(b + c)	$0.36	/ft2
e. *Total Synthetic Membrane Cost*		*(a x d)*	***$396,744***	

VIII. GEOTEXTILE FILTER FABRIC

a. Quantity of filter fabric needed		acres x 43560 ft2/acre=	0	ft2
b. Purchase unit cost			$0.00	/ft2
c. Installation unit cost			$0.00	/ft2
d. Total geotextile filter fabric unit cost		(b + c)	$0.00	/ft2
e. *Total Geotextile Filter Fabric Cost*		*(a x d)*	***$0***	

VIII.-a GEONET COMPOSITE

a. Quantity of Geonet Composite needed	25.3	acres x 43560ft2/acre	1102068	ft2
b. Purchase Unit Cost		$0.36	$0.36	/ft2
c. Installation Unit Cost		$0.15	$0.15	/ft2
d. Total Geonet Composite unit cost		(b + c)	$0.51	/ft2
e *Total Geonet Composite cost*		*(a x d)*	***$562,055***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 2

VIII.-b GEOSYNTHETIC CLAY LINER

a.	Quantity of liner needed		acres x 43560 ft2/acre	0	ft2
b.	Purchase unit cost			$0.00	/ft2
c.	Installation unit cost			$0.00	/ft2
d.	Total Clay Liner unit cost		(b + c)	$0.00	/ft2
e.	*Total clay liner cost*		*(a x d)*	***$0***	

IX. SOIL ADMIXTURE

a.	Area to be capped		acres x 4840 yd2	0	yd2
b.	Soil admixture unit cost		per yd2	$0.00	per yd2
c.	*Total Soil Admixture Cost*		*(a x b)*	***$0***	

X. PROTECTIVE SOIL COVER (applicable for CDD landfills only)

a.	Area to be capped		acres x 4840 yd2/acre	0	yd2
b.	Depth of soil needed		in x (1/36)yd	0.00	yd
c.	Quantity of soil needed		(a x b)	0	yd3
d.	Percentage of soil from off-site		%	0%	
e.	Purchase Unit cost off-site material (to include delivery cost)		per yd3	$0.00	/yd3
f.	Percentage of soil from on-site	100%	(1 - d)	100%	
g.	Excavation unit cost (on-site material)		per yd3	$0.00	per yd3
h.	Total soil unit cost		(d x e + f x g)	$0.00	
i.	Placement and Spreading Unit Cost		per yd3	$0.00	per yd3
j.	Compaction unit cost		per yd3	$0.00	per yd3
k.	Total soil unit cost		(h + I + j)	$0.00	/yd3
l.	Total soil cost			$0.00	
m.	Percent compaction	0%		0%	
o	*Total Topsoil Cost*		*(h) x (1 + l)*	**$0**	

XI. SOIL TESTING

a.	Number of acres to be capped		25.3	25.3	acres
b.	Testing unit cost (includes permeability tests and technician)		$1,200	$1,200.00	per acre
c.	*Total Soil Testing Unit Cost*		*(a x b)*	***$30,360***	

XII. VEGETATIVE COVER

a.	Number of acres to be vegetated		25.3	25.3	acres
b.	Unit cost for soil preparation, grading, seed, and fertilizer		$2,000.00	$2,000.00	per acre
c.	*Total Vegetative Cover Cost*		*(a x b)*	***$50,600***	

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 2

XIII. LANDFILL GAS (LFG) MANAGEMENT SYSTEM

a.	Number of acres of landfill to be closed		25.3	25.3	acres
b.	Number of LFG detection probes to be installed	5	(every 500' around cell)	5	wells
c.	Average number of LFG vents required per acre		1	1	vents
d.	Average cost per LFG vent		$5,000.00	$5,000.00	per vent
e.	Average LFG detection probe unit cost		$2,182.00	$2,182.00	per probe
f.	Total cost for LFG vents		(a x c x d)	$126,500.00	
g.	Total cost for LFG detection probes		(b x e)	$10,910.00	
h.	*Total Gas Management System Cost*		*(f + g)*	***$137,410***	

Sanitary Max. Spacing = 250 ft

CDD/Industrial Max. Spacing = 500 ft

XIV. GROUNDWATER MONITORING SYSTEM

a.	Hydrogeologic study unit cost (includes boring costs, piezometer costs, pump test costs, etc.)	$10,000 or as required		
b.	Monitoring well construction unit cost (includes installation and materials for a 50' deep well; minimum of four wells must be installed)		$0.00	per well
c.	Number of wells to be installed		0	wells
d.	Additional well length over 50'		0	LF
e.	Unit cost for additional well length over 50'		$0.00	per VLF
f.	Total additional cost for well length over 50'	(e x d)	$0.00	
g.	Total Monitoring Well Construction Cost	(b x c)	$0.00	
h.	*Total Groundwater Monitoring System Cost*	*(b x c) + (d x e)*	***$0.00***	

XV. MOBILIZATION/ DEMOBILIZATION

a.	*Cost for Mobilization/ Demobilization*	*$15,000 or as required*	***300,000***

XVI. SURVEY AND DEED NOTATION

a.	*Cost for Survey and Deed Notation*	*$2,000 or as required*	***86,066***

XVII. CLOSURE CERTIFICATION

a.	*Closure Certification Costs*	*$2,000 or as required*	***10,000***

Worksheet 1: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS
CELL VII - Phase 2

XVIII. MISCELLANEOUS COSTS TO CLOSE

a.	Erosion Control	$15,000 or as required	**150,000**
b.	Storm Water Control	$5,000 or as required	**164,852**
c.	*Total Miscellaneous Costs*	*(a + b)*	***314,852***

TOTAL CONSTRUCTION CLOSURE COSTS

Total Unadjusted Closure Costs (TUCC)=		
(I+II. . . XIV)		***$2,844,117***
City Cost Index (CCI) Appen B.=		
1 = 100%		***1***
Total Adjusted Closure Costs (TACC)=		
CCI x TUCC		***2,844,117***
Closure Cost Estimate Subtotal=		
(TACC +XV. . . . XVIII)		***3,555,035***
Contingency (10%)=		
(Subtotal x 0.1)		***355,504***
Engineering Fees=		
Construction Documents(5% or as needed)	*(Subtotal x 0.05)*	***177,752***
Construction Quality Assurance (10% or as needed)	(Subtotal x 0.1)	***355,504***
Total Closure Cost=		
(Subtotal +Contingency + Engineering)		***4,443,794***

ATTACHMENT XIII-1

Post-Closure Plan

POST-CLOSURE PLAN

for the

SOUTHEASTERN PUBLIC SERVICE AUTHORITY

REGIONAL LANDFILL

CELL VII EXPANSION

Prepared for:

Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320

Prepared by:

HDR Engineering, Inc.

August 2008
Revised February 2009
Revised February 2010
Revised December 2010

TABLE OF CONTENTS

LIST OF TABLES

APPENDIX

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SECTION 1.0

POST-CLOSURE PLAN

1.1 INTRODUCTION

This Post-Closure Plan (Plan) has been developed to outline steps required to ensure the environmental soundness of the Regional Landfill (Landfill) during its post-closure care period. The post-closure care period will last at least 30 years after closure completion and, at a minimum, will consist of the following:

- maintaining integrity and effectiveness of final cover system;
- maintaining and operating the leachate collection system;
- performing groundwater and surface water monitoring;
- maintaining and operating a gas monitoring system; and
- maintaining run-on/run-off controls.

SECTION 2.0
POST-CLOSURE CONTACT

All correspondence and questions concerning the post-closure care of the facility should be directed to:

Executive Director
Southeastern Public Service Authority
723 Woodlake Drive
Chesapeake, VA 23320-8909
(757) 420-4700

SECTION 3.0
MAINTENANCE

3.1 REPAIR OF SECURITY CONTROL DEVICES

All security control devices will be inspected and maintained as necessary to ensure access to the site is controlled. Locks, vehicular gates, and fencing will be replaced if functioning improperly. Warning signs will be kept legible at all times and will be replaced if damaged by inclement weather or vandalism.

3.2 EROSION DAMAGE REPAIR

If erosion of the final cover occurs during post-closure, the affected area will be repaired and reseeded as necessary. Excessive slopes will be flattened, if possible, by adding clean fill material. If necessary, erosion control fabrics will be used to expedite rapid re-vegetation of slopes and secure topsoil in place. Rough surfaces that cause isolated erosion areas will be smoothed and reseeded as necessary.

3.3 CORRECTION OF SETTLEMENT, SUBSIDENCE, AND DISPLACEMENT

Minimum slopes of two percent will be maintained after settlement in order to prevent ponding and allow for proper drainage without infiltration. If vertical or horizontal displacement occurs due to differential settlement, cracks will be filled with appropriate material and final cover will be reestablished. Excessive vertical displacement is not anticipated.

3.4 REPAIR OF RUN-ON/RUN-OFF CONTROL STRUCTURES

All terraces, ditches, and perimeter channels will be repaired, cleaned, or realigned in order to maintain in an operable condition. Any culverts that are damaged will be replaced. The drop inlet structures will be cleaned out at least once per year and on an as-needed basis.

3.5 LEACHATE COLLECTION SYSTEM

In order to maintain the free flow of leachate collection pipes, they will be cleared of debris using the manholes and cleanouts for access. If pipes fracture, leachate will flow through the granular trench backfill material. A continuous granular blanket will allow drainage of leachate even in the event of total failure of the leachate collection lines. Although total failure of the leachate collection system is unlikely, it may be possible to remove leachate from sumps constructed at the natural drainage points outside or inside the line.

3.6 GAS COLLECTION/VENTING SYSTEM

The Landfill gas collection and control system will continue to be maintained by an independent contractor. Proper operation of the systems is verified through monitoring of monthly wellfield operations reports provided by the selected contractor. The maintenance and operation of the landfill gas collection and control system is further described in § 6.0 of the Operations Manual (Permit Module II).

If methane gas recovery wells do not function as a result of irregular settlement, accumulation of liquids (condensate, leachate, and water), binding or corrosion, replacement wells may be installed if necessary or required through regulations.

3.7 GROUNDWATER MONITORING SYSTEM

All groundwater monitoring wells have been installed with concrete pads, protective casings, and bollards to prevent accidental damage by vehicles and equipment. The wells are also equipped with a locking cap to discourage vandalism. Groundwater wells will be inspected regularly (at the time of sampling) to ensure integrity. Persons inspecting a well should look for signs of well tampering, cracking, or degradation, and determine whether the well needs to be replaced. If the decision is made to replace and abandon a well, the replacement well should be installed 5 to 10 feet from the abandoned well in accordance with previous well specifications. Well abandonment is accomplished by pulling the casing out and grouting the hole.

SECTION 4.0
INSPECTION PLAN

4.1 INSPECTION FREQUENCIES

Inspections to be conducted during the post-closure care period will occur regularly as follows (see Post-Closure Inspection Checklist):

Item	Frequency
Security control devices	Monthly
Cover drainage system functioning	Semi-annually
Leachate collection and removal system	Monthly
Gas collection/venting system	Semi-annually
Groundwater monitoring system	Semi-annually
Erosion damage	Monthly
Cover settlement, subsidence, and displacement	Monthly
Vegetative cover condition	Monthly
Stormwater control system	Monthly
Benchmark integrity	Semi-annually

4.2 MONTHLY INSPECTIONS

Monthly inspections of the closed site will include examination of the security control devices for signs of deterioration or vandalism to ensure access to the site is limited to authorized persons. The leachate collection and removal system will be checked to ensure proper levels and flow of leachate from the lagoons and/or tanks. Samples of the leachate will be taken as required by Southeastern Public Service Authority's Hampton Roads Sanitation District (HRSD) permit. The previous disposal area will be checked to ensure the integrity of the final cover system is maintained, erosion damage is repaired, vegetative cover persists, and that cover settlement, subsidence and displacement are minimal. Drainage ditches will be cleared of litter and debris and benchmark integrity will be noted and maintained.

4.3 SEMI-ANNUAL INSPECTIONS

SPSA's contracted engineer will perform semi-annual inspections of the site during the post-closure period with detailed attention paid to integrity and drainage of the final cover system and proper functioning of the groundwater and gas monitoring systems. The engineer will report his findings to SPSA management via letter including any recommendations for actions necessary to ensure the site continues to meet the closure post-closure performance standard. The engineer will also receive copies of the monthly inspections reports and respond to any comments that demand immediate attention.

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POST-CLOSURE INSPECTION CHECKLIST

Location: ______________________________________

Date: ______________________________ Time: ____________________________________

Weather: ___________________________ Completed By: _____________________________

	Yes	No
I. Security Control Devices:		
Are security control devices in place and functioning?	☐	☐
Are all warning signs prominent and legible?	☐	☐
Are there any signs of unauthorized entry on the site?	☐	☐
Are there sings of illegal dumping on site?	☐	☐
II. Final Cover System:		
Is the final cover free of erosion and depressions?	☐	☐
Is there leachate seeping from the final cover? (If yes, make note of location on comment section below.)	☐	☐
Is the vegetative cover continuous and in good condition, free of bare spots?	☐	☐
Does the site require mowing? (If yes, mow grass and note in comment section below.)	☐	☐
Is there ponding of water on final cover system?	☐	☐
III. Groundwater Monitoring Wells:		
Is the casing upright and unobstructed?	☐	☐
Is the outer casing secure and locked?	☐	☐
Is the ID tag present and legible?	☐	☐
IV. Leachate Collection and Removal System:		
Are pumps working properly?	☐	☐
Are there any leaks in the forcemain?	☐	☐
Are the leachate controls working properly?	☐	☐
V. Gas Collection System:		
Is there ponding at any of the wells?	☐	☐
Is there air intrusion?	☐	☐
Are there any areas of dead or brown vegetation?	☐	☐
VI. Miscellaneous:		
Are all benchmarks visible and intact:	☐	☐
Are all ditches free of debris and litter?	☐	☐
Are any odors present which may indicate landfill gas migration?	☐	☐

POST-CLOSURE INSPECTION CHECKLIST - COMMENTS

Please use the section below to comment on any areas not covered above, areas of concern or areas needing immediate attention.

SECTION 5.0
MONITORING PLAN

5.1 GROUNDWATER AND SURFACE WATER MONITORING

Groundwater monitoring will continue on a regular basis throughout the post-closure care period, at a frequency determined by State and Federal regulatory requirements. Current regulations require semi-annual groundwater monitoring. The parameters chosen for analysis will be no less than the requirements of regulatory agencies. Sampling and analysis will be performed by an independent contractor in accordance with the sampling protocol and quality assurance/control procedures described in the Groundwater Monitoring Plan (Permit Module X/XI).

Samples will be collected at the surface water monitoring locations as shown on the drawings. Surface water monitoring will continue for the same duration as groundwater monitoring. Parameters to be monitored will be no less stringent than required by Federal and State agencies.

5.2 LEACHATE COLLECTION AND DISPOSAL

Currently, leachate produced by the Landfill is collected by gravity within the Landfill cells and then pumped via force main to HRSD. The production of leachate is expected to continue for years after final closure, although the rate of generation is expected to decline over time to less than 100 gallons per acre per day which is about 1.9 million gallons per year for Cell VII. Leachate treatment will continue to be required for a significant period of time after closure during which time pumps, flow meters, transducers, force mains, and other appurtenances will be inspected. The quantity and quality of the leachate will continue to be monitored on a monthly basis for all parameters as required by SPSA's Industrial Waste Discharge Permit. When the leachate has stabilized and, poses a reduced pollution potential, SPSA may apply to the Virginia Department of Environmental Quality’s (VDEQ) and HRSD to reduce testing and treatment requirements.

5.3 GAS MIGRATION

The site will be monitored using an explosimeter around the perimeter of the fill area and between the fill and adjacent buildings and property lines. Monitoring will take place at least quarterly for safety purposes. If it is determined that a gas venting system is required to control migration, a system including a series of vertical wells or gravel trench and collection piping will be incorporated. Gas monitoring is further described in § 6.0 of the Operations Manual.

5.4 GAS COLLECTION AND VENTING

During the post closure care period, monitoring of the landfill gas collection and control system will be performed in accordance with 40 CFR 60.750 as established by the United States Environmental Protection Agency. Additional information regarding the monitoring requirements of the landfill gas collection and control system are included in §6.0 of the Operations Manual.

The landfill gas collection and control system will continue to be monitored in accordance with both Virginia Department of Environmental Quality and the United States Environmental Protection Agency regulations. This may be continued by an independent contractor or be performed by SPSA employees.

SECTION 6.0

POST-CLOSURE USE AND COST

As part of the initial agreement between SPSA and the City of Suffolk (City) to build the Landfill, the site will be deeded to the City following closure completion. The City intends to use the site for recreational purposes. Future uses will be restricted to those that will not compromise the integrity of the final cover, groundwater, leachate collection, and gas monitoring systems.

An estimate has been prepared to determine the post-closure costs. Tables 6.1 through 6.4 present a summary of post-closure costs for Cells I-IV, Cell V-VI, and Cell VII Phases 1 and 2 respectively. Detailed worksheets of the necessary items, associated quantities, and unit costs are included in Appendix A.

Table 6-1
Post-Closure Costs Cells I-IV

Engineering Opinion of Probable Post-Closure Costs
SPSA Regional Landfill Cells I - IV

	Item Description	Quantity	Unit	Unit Price	Total
I.	Groundwater Monitoring (30 wells)	4	Event	$11,122.80	$44,500
II.	Landfill Gas Monitoring	4	Event	$603.00	$2,400
III.	Leachate Management	3,650,000	GAL	$0.003	$11,000
IV.	Routine Maintenance and Repairs	1	LS	$53,200.00	$53,200
V.	Vector and Rodent Control	1	LS	$2,000.00	$2,000
	Total Post-Closure Costs				$113,000
	City Cost Index			1	
	Adjusted Total Costs Per Year				$113,000
	Length of Post-Closure Care Period	29	YEAR		
TOTAL POST-CLOSURE CARE COSTS		100	AC	$32,777	**$3,277,700**

Notes:
1. Totals are rounded to nearest hundred.
2. The estimate is based on 100 acres using 2008 costs.
3. These cost estimates are for a third party and include labor and installation.
4. A detailed breakdown of costs is included in Appendix A.

Table 6-2
Post-Closure Costs Cells V-VI

Engineering Opinion of Probable Post-Closure Costs
SPSA Regional Landfill Cells V-VI

Item Description		Quantity	Unit	Unit Price	Total
I.	Groundwater Monitoring (30 wells)	4	Event	$11,122.80	$44,500
II.	Landfill Gas Monitoring	4	Event	$603.00	$2,400
III.	Leachate Management	3,109,800	GAL	$0.003	$9,300
IV.	Routine Maintenance and Repairs	1	LS	$45,500.00	$45,500
V.	Vector and Rodent Control	1	LS	$2,000.00	$2,000
	Total Post-Closure Costs				$103,800
	City Cost Index			1	
	Adjusted Total Costs Per Year				$103,800
	Length of Post-Closure Care Period	30	YEAR		
TOTAL POST-CLOSURE CARE COSTS		85.2	AC	$36,541	**$3,113,300**

Notes:

1. Totals are rounded to nearest hundred.
2. The estimate is based on 85.2 acres using 2008 costs.
3. These cost estimates are for a third party and include labor and installation.
4. City Cost Index was selected to be 1 as unit costs are based on local and current costs.
5. A detailed breakdown of costs is included in Appendix A.

Table 6-3
Post-Closure Costs Cell VII Phase 1

Engineering Opinion of Probable Post-Closure Costs
SPSA Regional Landfill Cell VII - Phase 1

Item Description		Quantity	Unit	Unit Price	Total
I.	Groundwater Monitoring (37 wells)	4	Event	$12,808.12	$51,200
II.	Landfill Gas Monitoring	4	Event	$603.00	$2,400
III.	Leachate Management	1,124,200	GAL	$0.003	$3,400
IV.	Routine Maintenance and Repairs	1	LS	$16,800.00	$16,800
V.	Vector and Rodent Control	1	LS	$2,000.00	$2,000
	Total Post-Closure Costs				$75,800
	City Cost Index			1	
	Adjusted Total Costs Per Year				$75,800
	Length of Post-Closure Care Period	30	YEAR		
TOTAL POST-CLOSURE CARE COSTS		30.8	AC	$73,832	**$2,274,000**

Notes:

1. Totals are rounded to nearest hundred.
2. The estimate is based on 37.4 acres using 2008 costs.
3. These cost estimates are for a third party and include labor and installation.
4. City Cost Index was selected to be 1 as unit costs are based on local and current costs.
5. A detailed breakdown of costs is included in Appendix A.

Table 6-4
Post-Closure Costs Cell VII Phase 2

Engineering Opinion of Probable Post-Closure Costs
SPSA Regional Landfill Cell VII - Phase 2

Item Description		Quantity	Unit	Unit Price	Total
I.	Groundwater Monitoring (37 wells)	4	Event	$12,808.12	$51,200
II.	Landfill Gas Monitoring	4	Event	$603.00	$2,400
III.	Leachate Management	923,450	GAL	$0.003	$2,800
IV.	Routine Maintenance and Repairs	1	LS	$13,900.00	$13,900
V.	Vector and Rodent Control	1	LS	$2,000.00	$2,000
	Total Post-Closure Costs				$72,300
	City Cost Index			1	
	Adjusted Total Costs Per Year				$72,300
	Length of Post-Closure Care Period	30	YEAR		
TOTAL POST-CLOSURE CARE COSTS		25.3	AC	$85,720	**$2,168,700**

Notes:

1. Totals are rounded to nearest hundred.
2. The estimate is based on 16.2 acres using 2008 costs.
3. These cost estimates are for a third party and include labor and installation.
4. City Cost Index was selected to be 1 as unit costs are based on local and current costs.
5. A detailed breakdown of costs is included in Appendix A.

SECTION 7.0
TRAINING

SPSA will adequately train personnel to perform routine post-closure inspections of the Landfill. A certified environmental laboratory will perform groundwater sampling and analysis while a contracted environmental consulting firm will perform gas monitoring. SPSA's contracted engineer will be responsible for proper functioning of the final cover system and leachate collection system.

APPENDIX A

Worksheets for Estimation of Post-Closure Costs:

Cells I-IV

Cells V-VI

Cells VII Phase 1

Cells VII Phase 2

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS
SPSA Regional Landfill - Cells I-IV

Facility Name: SPSA Regional Landfill - Cells I-IV
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434
0
County Administrator:
OPM Representative Completing HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills: Closure Costs - all sections except Section X
Post-Closure - all sections
CDD Landfills: Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII
Post-Closure - all sections

I. GROUNDWATER MONITORING

a.	Total number of monitoring wells	30		30	wells
b.	year	4		120	samples/yr
c.	Other samples (e.g., QA/QC)		samples/event	0	samples/yr
d.	Analysis costs (see worksheet 3 for minimum defaults)	$200.00	$/sample	$200.00	/sample
e.	Total analysis costs		(b+c) x d	$24,000.00	
f.	Miscellaneous engineering fees/report	$15,000.00	$10,000 or as required	$15,000.00	
g.	Mobilization	$150.00		$150.00	/event
h.	Technician field costs	$40.76		$40.76	/well
i.	Total sampling costs	(g x b) + (h x a x b)	(g x b) + (h x a x b)	$5,491.20	
k	*Total Yearly Groundwater Monitoring Cost*	*(e + f + i)*		***$44,491.20***	/yr

II. LANDFILL GAS MONITORING

a.	Frequency of Testing	4		4	rounds/yr
b.	Cost of sampling per round	$603.00		$603.00	/round
c.	*Total Gas Monitoring Cost Per Year*	*(a x b)*		**$2,412**	/yr

III. LEACHATE MANAGEMENT

a.	Private disposal unit cost		$/gallon	$0.00	/gallon
b.	POTW disposal unit cost	$0.003	$/gallon	$0.00	/gallon
c.	Direct discharge to POTW unit cost		$/gallon	$0.00	/gallon
d.	Amount of leachate generated from facility records or modeling	3,650,000		3650000	gallons/yr
e.	Hauling cost		$/gallon	$0.00	/gallon
f.	Total leachate management cost			***$10,950***	/yr

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS

SPSA Regional Landfill - Cells I-IV

IV. ROUTINE MAINTENANCE AND REPAIRS

a.	Mowing frequency	3	usually 3 visits/year	3	visits/yr
b.	repairs	100		100	acres
c.	Mowing unit cost per visit	$80.00		$80.00	/acre/visit
d.	Total Mowing Cost Per Year	(a x b x c)		$24,000.00	/yr
e.	Fertilizer unit cost	150		$150	/acre
f.	Total Fertilizer Cost Per Year	(b x e)		$15,000.00	/yr
g.	Area to reseed/year	30	landfill acreage/year	30	acres
h.	Reseeding unit cost	$379.00		$379.00	/acre
i.	Total Reseeding Cost Per Year	(g x h)		$11,370.00	/yr
k.	Mobilization/ Demobilization cost per year	$300.00		$300	/yr
l.	Cap erosion repair	1	usually 1% of cap area/year	1	acres
m.	Erosion repair unit cost	$2,500.00	Assumed 18"depth	$2,500.00	/acre
n.	Total Erosion Repair Cost Per Year	(l x m)		$2,500.00	/year
0	*Total Maintenance and Repairs Cost Per Year*	*(d + f + l+k+n)*		***$53,170***	**/yr**

V. VECTOR AND RODENT CONTROL

a.	*Total Vector and Rodent Control Costs Per Year*	*$2,000 or as required*	***$2,000***	**/yr**

Total Post-Closure Cost (TPCC)		***$113,023***	
City Cost Index (CCI) Appen B.=	100%=1	***1***	
Adjusted Total Costs (ATC) = (CCI) x TPCC	=	**$113,023**	**/yr**
Length of Post-Closure Care Period		29	
Total Post Closure Care Costs = ATC x Post Closure Period		**$3,277,673**	

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS

SPSA Regional Landfill - Cells V-VI

Facility Name: SPSA Regional Landfill - Cells V-VI
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434
0
County Administrator:
OPM Representative Completing HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills: Closure Costs - all sections except Section X
Post-Closure - all sections
CDD Landfills: Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII
Post-Closure - all sections

I. GROUNDWATER MONITORING

a.	Total number of monitoring wells	30		30	wells
b.	year	4		120	samples/yr
c.	Other samples (e.g., QA/QC)		samples/event	0	samples/yr
d.	Analysis costs (see worksheet 3 for minimum defaults)	$200.00	$/sample	$200.00	/sample
e.	Total analysis costs		(b+c) x d	$24,000.00	
f.	Miscellaneous engineering fees/report	$15,000.00	$10,000 or as required	$15,000.00	
g.	Mobilization	$150.00		$150.00	/event
h.	Technician field costs	$40.76		$40.76	/well
i.	Total sampling costs	(g x b) + (h x a x b)	(g x b) + (h x a x b)	$5,491.20	
k	*Total Yearly Groundwater Monitoring Cost*	*(e + f + i)*		***$44,491.20***	/yr

II. LANDFILL GAS MONITORING

a.	Frequency of Testing	4	4	rounds/yr
b.	Cost of sampling per round	$603.00	$603.00	/round
c.	*Total Gas Monitoring Cost Per Year*	*(a x b)*	***$2,412***	/yr

III. LEACHATE MANAGEMENT

a.	Private disposal unit cost		$/gallon	$0.00	/gallon
b.	POTW disposal unit cost	$0.003	$/gallon	$0.00	/gallon
c.	Direct discharge to POTW unit cost		$/gallon	$0.00	/gallon
d.	Amount of leachate generated from facility records or modeling	3,109,800		3109800	gallons/yr
e.	Hauling cost		$/gallon	$0.00	/gallon
f.	Total leachate management cost			***$9,329***	/yr

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS
SPSA Regional Landfill - Cells V-VI

IV. ROUTINE MAINTENANCE AND REPAIRS

a.	Mowing frequency	3	usually 3 visits/year	3	visits/yr
b.	repairs	85.2		85.2	acres
c.	Mowing unit cost per visit	$80.00		$80.00	/acre/visit
d.	Total Mowing Cost Per Year	(a x b x c)		$20,448.00	/yr
e.	Fertilizer unit cost	150		$150	/acre
f.	Total Fertilizer Cost Per Year	(b x e)		$12,780.00	/yr
g.	Area to reseed/year	25.56	landfill acreage/year	25.56	acres
h.	Reseeding unit cost	$379.00		$379.00	/acre
i.	Total Reseeding Cost Per Year	(g x h)		$9,687.24	/yr
k.	Mobilization/ Demobilization cost per year	$500.00		$500	/yr
l.	Cap erosion repair	0.852	usually 1% of cap area/year	0.852	acres
m.	Erosion repair unit cost	$2,500.00	Assumed 18"depth	$2,500.00	/acre
n.	Total Erosion Repair Cost Per Year	(l x m)		$2,130.00	/year
0	*Total Maintenance and Repairs Cost Per Year*	*(d + f + l+k+n)*		***$45,545***	**/yr**

V. VECTOR AND RODENT CONTROL

a.	*Total Vector and Rodent Control Costs Per Year*	*$2,000 or as required*	***$2,000***	**/yr**

Total Post-Closure Cost (TPCC)		***$103,778***	
City Cost Index (CCI) Appen B.=	100%=1	***1***	
Adjusted Total Costs (ATC) = (CCI) x TPCC	=	**$103,778**	**/yr**
Length of Post-Closure Care Period		30	
Total Post Closure Care Costs = ATC x Post Closure Period		**$3,113,335**	

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS

SPSA Regional Landfill - Cell VII - Phase 1

Facility Name: SPSA Regional Landfill - Cell VII - Phase 1
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434
0
County Administrator:
OPM Representative Completing Format: HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills:	Closure Costs - all sections except Section X Post-Closure - all sections
CDD Landfills:	Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII Post-Closure - all sections

I. GROUNDWATER MONITORING

a.	Total number of monitoring wells	37		37	wells
b.	year	4		148	samples/yr
c.	Other samples (e.g., QA/QC)		samples/event	0	samples/yr
d.	Analysis costs (see worksheet 3 for minimum defaults)	$200.00	$/sample	$200.00	/sample
e.	Total analysis costs		(b+c) x d	$29,600.00	
f.	Miscellaneous engineering fees/report	$15,000.00	$10,000 or as required	$15,000.00	
g.	Mobilization	$150.00		$150.00	/event
h.	Technician field costs	$40.76		$40.76	/well
i.	Total sampling costs	(g x b) + (h x a x b)	(g x b) + (h x a x b)	$6,632.48	
k	*Total Yearly Groundwater Monitoring Cost*	*(e + f + i)*		***$51,232.48***	/yr

II. LANDFILL GAS MONITORING

a.	Frequency of Testing	4	4	rounds/yr
b.	Cost of sampling per round	$603.00	$603.00	/round
c.	*Total Gas Monitoring Cost Per Year*	*(a x b)*	***$2,412***	/yr

III. LEACHATE MANAGEMENT

a.	Private disposal unit cost		$/gallon	$0.00	/gallon
b.	POTW disposal unit cost	$0.003	$/gallon	$0.00	/gallon
c.	Direct discharge to POTW unit cost		$/gallon	$0.00	/gallon
d.	Amount of leachate generated from facility records or modeling	1,124,200		1124200	gallons/yr
e.	Hauling cost		$/gallon	$0.00	/gallon
f.	Total leachate management cost			***$3,373***	/yr

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS

SPSA Regional Landfill - Cell VII - Phase 1

IV. ROUTINE MAINTENANCE AND REPAIRS

a.	Mowing frequency	3	usually 3 visits/year	3	visits/yr
b.	Area involved in maintenance and repairs	30.8		30.8	acres
c.	Mowing unit cost per visit	$80.00		$80.00	/acre/visit
d.	Total Mowing Cost Per Year	(a x b x c)		$7,392.00	/yr
e.	Fertilizer unit cost	150		$150	/acre
f.	Total Fertilizer Cost Per Year	(b x e)		$4,620.00	/yr
g.	Area to reseed/year	9.24	usually 1/3 of landfill acreage/year	9.24	acres
h.	Reseeding unit cost	$379.00		$379.00	/acre
i.	Total Reseeding Cost Per Year	(g x h)		$3,501.96	/yr
k.	Mobilization/ Demobilization cost per year	$500.00		$500	/yr
l.	Cap erosion repair	0.308	usually 1% of cap area/year	0.308	acres
m.	Erosion repair unit cost	$2,500.00	Assumed 18"depth	$2,500.00	/acre
n.	Total Erosion Repair Cost Per Year	(l x m)		$770.00	/year
0	*Total Maintenance and Repairs Cost Per Year*	*(d + f + l+k+n)*		***$16,784***	**/yr**

V. VECTOR AND RODENT CONTROL

a.	*Total Vector and Rodent Control Costs Per Year*	*$2,000 or as required*	***$2,000***	**/yr**

Total Post-Closure Cost (TPCC)		***$75,801***	
City Cost Index (CCI) Appen B.=	100%=1	***1***	
Adjusted Total Costs (ATC) = (CCI) x TPCC	=	**$75,801**	**/yr**
Length of Post-Closure Care Period		30	
Total Post Closure Care Costs = ATC x Post Closure Period		**$2,274,031**	

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS
SPSA Regional Landfill - Cell VII - Phase 2

Facility Name: SPSA Regional Landfill - Cell VII - Phase 2
Permit Number: 417
Facility Address: 1 Bob Foeller Drive
Suffolk, VA 23434
0
County Administrator:
OPM Representative Completing Format: HDR Engineering, Inc.
Date Completed: 6-Dec-10

Sanitary and Industrial Landfills: Closure Costs - all sections except Section X
Post-Closure - all sections
CDD Landfills: Closure Costs - Sections X, XII, XIII, XIV, XV, XVI, XVII
Post-Closure - all sections

I. GROUNDWATER MONITORING

a.	Total number of monitoring wells	37		37	wells
b.	year	4		148	samples/yr
c.	Other samples (e.g., QA/QC)		samples/event	0	samples/yr
d.	Analysis costs (see worksheet 3 for minimum defaults)	$200.00	$/sample	$200.00	/sample
e.	Total analysis costs		(b+c) x d	$29,600.00	
f.	Miscellaneous engineering fees/report	$15,000.00	$10,000 or as required	$15,000.00	
g.	Mobilization	$150.00		$150.00	/event
h.	Technician field costs	$40.76		$40.76	/well
i.	Total sampling costs	(g x b) + (h x a x b)	(g x b) + (h x a x b)	$6,632.48	
k	*Total Yearly Groundwater Monitoring Cost*	*(e + f + i)*		***$51,232.48***	/yr

II. LANDFILL GAS MONITORING

a.	Frequency of Testing	4	4	rounds/yr
b.	Cost of sampling per round	$603.00	$603.00	/round
c.	*Total Gas Monitoring Cost Per Year*	*(a x b)*	***$2,412***	/yr

III. LEACHATE MANAGEMENT

a.	Private disposal unit cost		$/gallon	$0.00	/gallon
b.	POTW disposal unit cost	$0.003	$/gallon	$0.00	/gallon
c.	Direct discharge to POTW unit cost		$/gallon	$0.00	/gallon
d.	Amount of leachate generated from facility records or modeling	923,450		923450	gallons/yr
e.	Hauling cost		$/gallon	$0.00	/gallon
f.	Total leachate management cost			***$2,770***	/yr

Worksheet 2: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS

SPSA Regional Landfill - Cell VII - Phase 2

IV. ROUTINE MAINTENANCE AND REPAIRS

a.	Mowing frequency	3	usually 3 visits/year	3	visits/yr
b.	Area involved in maintenance and repairs	25.3		25.3	acres
c.	Mowing unit cost per visit	$80.00		$80.00	/acre/visit
d.	Total Mowing Cost Per Year	(a x b x c)		$6,072.00	/yr
e.	Fertilizer unit cost	150		$150	/acre
f.	Total Fertilizer Cost Per Year	(b x e)		$3,795.00	/yr
g.	Area to reseed/year	7.59	usually 1/3 of landfill acreage/year	7.59	acres
h.	Reseeding unit cost	$379.00		$379.00	/acre
i.	Total Reseeding Cost Per Year	(g x h)		$2,876.61	/yr
k.	Mobilization/ Demobilization cost per year	$500.00		$500	/yr
l.	Cap erosion repair	0.253	usually 1% of cap area/year	0.253	acres
m.	Erosion repair unit cost	$2,500.00	Assumed 18"depth	$2,500.00	/acre
n.	Total Erosion Repair Cost Per Year	(l x m)		$632.50	/year
0	*Total Maintenance and Repairs Cost Per Year*	*(d + f + I+k+n)*		***$13,876***	**/yr**

V. VECTOR AND RODENT CONTROL

a.	*Total Vector and Rodent Control Costs Per Year*	*$2,000 or as required*	***$2,000***	**/yr**

Total Post-Closure Cost (TPCC)		***$72,291***	
City Cost Index (CCI) Appen B.=	100%=1	***1***	
Adjusted Total Costs (ATC) = (CCI) x TPCC	=	**$72,291**	**/yr**
Length of Post-Closure Care Period		30	
Total Post Closure Care Costs = ATC x Post Closure Period		**$2,168,728**	