

Appendix A

Landfill Gas Extraction Well
Replacement Specifications

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SECTION 01010

SUMMARY OF WORK

ARCADIS (ENGINEER), on behalf of the New York City Department of Environmental Protection (DEP), is soliciting bids for landfill gas extraction well drilling and replacement services at the Pelham Bay Landfill (PBL or Site), located in Bronx, New York. This work will be contracted by Severn Trent Environmental Systems, Inc. (STES), who is the current PBL Operation, Maintenance and Monitoring (OM&M) CONTRACTOR, and will be funded by New York City. As such, all cost estimates must be based on prevailing New York City wage rates, and the selected bidder (hereinafter referred to as the CONTRACTOR) and any proposed subcontractors must be VENDEX approved. For review purposes, a draft copy of the contract document(s) is attached to this bid solicitation (Attachment 1).

All bid proposals should include the estimated time that it will take to complete the project and any additional information, which may be helpful in evaluating bids, should be attached to the bid proposal.

Completed bid proposals, as described in Section 01010, Part 3, herein, are to be received at the following address by no later than 5:00 PM EST on July 23, 2009:

ARCADIS
2 Huntington Quadrangle, Suite 1S10
Melville, New York 11747
Attention: Mr. Arnas Nemickas

Additionally, there will be an optional, Pre-Bid Meeting for all interested bidders at 10:00 AM EST, on Thursday, July 9, 2009. The Pre-Bid Meeting will take place at the Pelham Bay Landfill, 301 Shore Road, Bronx, New York, and is being held to provide prospective bidders an opportunity to see the Site setting where the work will be conducted.

A representative of the ENGINEER will conduct the pre-bid meeting and will be available to answer questions. It is the bidder's responsibility to understand the Site setting and work scope requested when submitting a response to this bid solicitation.

The CONTRACTOR shall perform all operations, and provide all necessary manpower, materials, equipment, tools, and services required to drill and install up to four (4) replacement landfill gas extraction wells. The subject work will be performed at the PBL, located in, Bronx County, New York. Additionally, the CONTRACTOR is advised that this project is being performed at a New York State Superfund Site, and is identified as a Class 2 Inactive Hazardous Waste Disposal Site by the New York State Department of Environmental Conservation (NYSDEC).

The scope of work is generally summarized below. Please note that the provisions of this Section are supplementary to other provisions specified elsewhere in the Contract Documents.

PART 1 - GENERAL

1. The CONTRACTOR shall obtain all permits, certificates, and licenses required of him by law for the execution of this work.
2. The CONTRACTOR shall comply with all federal, state, and local laws, ordinances, or rules and regulations relating to the performance of the work specified herein.

3. All work shall be conducted in accordance with a site-specific Health and Safety Plan (HASP) to be developed by the CONTRACTOR (in accordance with Section 10190 of this bid solicitation) and submitted to the ENGINEER and DEP for approval, prior to start of any field work. It is anticipated that work will be conducted in Level D personal protection, unless otherwise required, based on the HASP. CONTRACTOR shall be responsible for providing OSHA HAZWOPR-trained crews with necessary personal protection to conform to the HASP requirements. CONTRACTOR shall provide copies of the OSHA 40-hour training certificates and 8-hour annual refresher certificates for all field crew members and all other certifications required under OSHA.
4. In addition to the HASP described above, prior to initiation of any intrusive work, the CONTRACTOR will be required to develop and implement a Community Air Monitoring Program (CAMP), consistent with requirements provided in Appendix 1A of NYSDEC DER-10. The draft CAMP must be provided to the DEP and ENGINEER for review prior to use.
5. Water is available on-site.
6. The DEP reserves the right to contract none, some, or all of the work specified herein.

PART 2 - WORK REQUIRED

- A. Mobilization/Demobilization
 1. CONTRACTOR shall mobilize/demobilize rig(s) (including all tools), full crew, support truck, and any necessary equipment and materials to/from the 4 extraction well locations.
 2. The drill rig shall be a track-mounted rig to distribute the weight of the rig, and minimize disturbance to the landfill cover system.
 3. A staging area for equipment will be provided on-site and shall be coordinated with the DEP and on-site OM&M Contractor.
- B. Site Preparation
 1. CONTRACTOR shall clear all subsurface utilities, as necessary, and notify New York City One Call Center prior to beginning any activities.
 2. CONTRACTOR shall remove and dispose of the existing fence enclosure around each extraction well drilling location.
 3. CONTRACTOR shall remove the cover soils to expose the underlying geocomposite liner. The excavation area shall be of sufficient size to accommodate the drill rig and all necessary equipment and personnel to complete the work. The excavation side walls shall be sloped or benched to prevent side wall collapse and provide a safe work area. The excavation shall include a sloped access for the drilling equipment and personnel to safely enter/exit the excavated work area.
 4. CONTRACTOR shall use all precautions and means necessary as to not breach the geocomposite liner.
 5. The excavated cover soils shall be segregated (topsoil and loamy soil) and staged adjacent to each work area. The excavated cover soils are to be staged on and covered with plastic for future backfilling upon completion of the well installation and liner repairs.
 6. The base of each excavation (work area) shall be covered with plywood (or other approved material) to protect the geocomposite liner from damage. The drill rig and all

- drilling equipment and personnel shall remain on the plywood base during drilling operations.
7. CONTRACTOR shall provide the necessary excavation dimensions to complete the task with the proposal and cost estimate submission.
 8. CONTRACTOR shall hire a qualified/certified landfill cap installer to remove the geocomposite liner around each borehole. The section of liner to be removed shall be minimized and of sufficient size to accommodate advancement of the drilling equipment.

C. Decontamination of Equipment

1. An on-site area will be designated by the OM&M CONTRACTOR for decontamination of the drill rig and drilling equipment.
2. The CONTRACTOR shall provide/construct a heavy-duty lined decontamination pad of sufficient size to accommodate containment of all fluids generated during decontamination of the drilling rig, tools, and ancillary equipment.
3. Prior to the drilling of the first borehole, and after the drilling, installation of each well, the CONTRACTOR shall decontaminate all drilling bits, rods, tremie pipes, and any other tools to be used in the drilling and well installation operations.
4. The CONTRACTOR shall have a steam-cleaning unit on the work site to be used for decontamination of his equipment.
5. The volume of water generated during decontamination is expected to be minimal. There will be no disposal of water without NYCDEP approval. If a sufficient volume of water is generated that requires disposal, it is anticipated that the water will be disposed of into the site leachate collection system after NYCDEP approval.

D. Borehole Drilling

1. A 36-inch diameter borehole is required at each drilling location (Figures 1 and 2). The boreholes will be drilled using methodology capable of drilling this diameter to the proposed depths.
2. The CONTRACTOR shall over-drill the existing gas extraction well at each proposed location.
3. The boreholes shall be advanced to a depth equal to the depth of the existing water table. A table summarizing the approximate target depths is provided on Figure 2. Actual boring depths will be determined in the field based on existing conditions.
4. All and any means necessary to prevent fire or explosion, due to methane at the landfill, shall be employed by the CONTRACTOR. This could include the introduction of a continuous flow of nitrogen into the borehole, through the drilling apparatus, during drilling operations to displace the methane in the borehole, or other approved method. The bid proposal shall specify what method will be used and the CONTRACTOR's HASP shall include this procedure.
5. No sampling will be conducted during the drilling of the borehole.

E. Gas Extraction Well Installation

1. One replacement gas extraction well will be installed in each borehole. Typical well construction details are provided on Figure 2.

1. The CONTRACTOR shall, at all times, limit access to the drill sites and excavated areas by the use of barricades, fencing, etc. and maintain the work area in a clean, workable condition.

PART 3 - MISCELLANEOUS

3. Each work area shall be graded and seeded in accordance with DHP requirements.
 2. The fence enclosure details are provided on Attachment 2.
 1. Upon completion of the well and wellhead installation, CONTRACTOR shall furnish and install all material necessary to construct chain link fence enclosures around each gas extraction well.
- H. Site Restoration
3. Typical landfill gas extraction wellhead assembly details are provided on Figure 2.
 - A transition from the eight (8) inch diameter HDPE well casing to the three (3) inch wellhead assembly
 - A dust cap
 - A static pressure port
 - An impact pressure port
 - A temperature port or permanent thermometer
 - A Union disconnect
 - A flow control gate valve
 - A gas sample port, and
 - A three (3) inch diameter flex hose connecting the wellhead assembly to the gas conveyance system
 2. The wellhead assembly shall include:
 1. Upon completion of the gas extraction well installation, each well will be furnished with a CE-LANDTECH ACCU-FLO (Model 300) landfill gas wellhead.
 1. Gas Extraction Wellhead Installation
- G. Gas Extraction Wellhead Installation
2. After all geomembrane boots are installed and any other liner repairs made, each excavation area shall be backfilled using the same materials that were excavated while preparing the drill site. The soils shall be placed as a two (2) foot layer of loamy soil directly above the geocomposite liner followed by a six (6) inch topsoil layer. A typical cover soil section is provided on Figure 3.
 1. Upon completion of the well installations, a geomembrane boot shall be installed around each gas extraction well. A certified landfill liner installer shall install the geomembrane boot and complete repairs to the existing cover system. The geomembrane boot shall be sealed to the existing liner and extend a minimum of three (3) feet above the top of the geocomposite liner. Typical geomembrane boot details are provided on Figure 2.
- F. Liner and Cover System Repair
2. The gas extraction wells will be extend to 5-ft above the top of the existing geomembrane/composite liner and finished with a sealed cap until the installation of the wellhead assembly.
 3. Detailed Specifications for the landfill gas extraction wells and wellheads are provided on in Section 02670.

Deliverable/Milestone	Date
Site/Bid Walk	07/09/2009 at 10 AM
Proposal, bid documents and cost estimate due	07/23/2009 by 5 PM
Field mobilization	2 weeks following notice to proceed
Well replacement completion	To be determined

PART 4 - SCHEDULE

2. Working hours shall be 8-hr work day; Monday through Friday.
3. Bidders shall prepare a bid proposal for submittal to the ENGINEER to include, at a minimum:
 - a. Description of Work
 - b. Means and Methods to complete work, including a list of all subcontractors proposed for use
 - c. Materials
 - d. Schedule
 - e. Cost Estimate, prepared and submitted on the attached Bid Form provided as Attachment 3
 - f. Comments to draft contract document(s)
 - g. Other
4. Prior to site mobilization, the CONTRACTOR shall finalize subcontractor agreements; provide insurance and indemnification, as required by STES.
5. Reflective of the DEP's policy to seek Women/Minority-owned enterprises (W/MBE) participation to the maximum extent possible, proposals should demonstrate the level of participation of W/MBE firms, either as Prime, Sub-contractors or as joint ventures. The NYCDEP recognizes the Minority and Women-Owned Business Enterprise (W/MBE) certification of the New York City Department of Small Business Services; New York State Empire State Development Corporation's Division of Minority and Women's Business Development and the Port Authority of New York & New Jersey. W/MBE certification from another state other than New York and New Jersey is not acceptable. Bidders shall provide copies of certificates in their bid package.

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Methods for measuring and calculating quantities for the Bid Form (i.e., Schedule of Values).

- B. Basis of payment for all contract bid items in the Bid Form.

- C. Values of unit prices.

- D. Description for payment of extra work or changes.

- E. Discussion of payment for rejected materials.

1.2 MEASUREMENT

- A. Performed according to United States Standard measure.
- B. Based on actual units installed or neat line dimensions of work completed.

1.3 CALCULATION OF QUANTITIES

- A. Progress Payment Quantities: CONTRACTOR will compute all quantities of Work performed, or of materials and equipment delivered to the site for progress payment purposes.
- B. Final Payment Quantities: CONTRACTOR will compute all quantities of Work performed, or of materials and equipment delivered to the site for final payment purposes.

1.4 PAYMENT

- A. In accordance with lump sum or unit price as provided on the Bid Form.
- B. Includes all costs for overhead and profit and for supplying materials, labor, equipment, and tools, necessary to complete the Work in accordance with the Specifications, Drawings, and Contract Conditions.

1.5 QUANTITIES

- A. The number of units and quantities contained in the Bid Form are approximate only. It shall be the CONTRACTOR'S responsibility to verify all bid quantities prior to submittal of bids, as well as for the performance of the work. Final payment will be made for the actual number of units and quantities incorporated in the work or made necessary to complete the project.
- B. In the event that work and materials or equipment are required to be furnished to a greater or lesser extent than is indicated by the Contract Documents, such work and materials or equipment will be furnished in greater or lesser quantities.

1.6 CHANGES AND EXTRA WORK

- A. Changes and extra work will be measured and paid for in accordance with the requirements of this Section.

1.7 REJECTED MATERIALS

- A. Quantities of material wasted or disposed in a manner not called for in the Specifications; rejected loads of material, including material rejected after it has been placed by reasons of the failure of CONTRACTOR to conform to the provisions of the Specifications; material not unloaded from the transporting vehicle; material placed outside the limits indicated by the Drawings or established by the Contract or material remaining on hand after completion of the Work, will not be paid for, and such quantities will not be included in the final total quantities. No compensation will be permitted for loading, hauling, and disposing of rejected material.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION 01025

SECTION 01052

LAYOUT OF WORK AND SURVEYS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: General requirements for survey work to be performed by the CONTRACTOR for layout of work features, for performance of work, and for field measurements of work quantities for payment purposes.
- B. Before commencing any surveys, the CONTRACTOR shall notify the ENGINEER at least 2 days written notice so that the ENGINEER may witness such Work.

1.2 DESCRIPTION

- A. Reference Points: The reference points to be provided by the ENGINEER will include referenced monuments and elevation bench marks on the property. If displaced by the CONTRACTOR or the CONTRACTOR's agents, replacement of these reference points will be at the expense of the CONTRACTOR. All other necessary reference points shall be established by the CONTRACTOR.
- B. The CONTRACTOR shall furnish all necessary detail survey including all lines, grades, and appropriate surveys as specified.
- C. The ENGINEER reserves the right to perform any desired checking and correction of the CONTRACTOR's surveys but this shall not relieve the CONTRACTOR of the responsibility for adequate performance of the Work.
- D. Equipment and Personnel: The CONTRACTOR's instruments and other survey equipment shall be accurate, suitable for the surveys required in accordance with recognized professional standards, and in proper condition and adjustment at all times. Initial layout and record surveys shall be performed under the direct supervision of a licensed surveyor.

- E. Field Notes and Records: The CONTRACTOR shall record surveys in field notebooks. A duplicate of each field notebook shall be furnished to the ENGINEER when filled or completed.
- F. Use by the ENGINEER: The ENGINEER may at any time use line and grade points and markers established by the CONTRACTOR. The CONTRACTOR's surveys are a part of the Work and may be checked by the ENGINEER or representatives of the DEP at any time. The CONTRACTOR shall be responsible for (1) any lines, grades, or measurements which do not comply with specified or proper tolerances, or which are otherwise defective, and (2) for any resultant defects in the Work. The CONTRACTOR will be required to conduct resurveys or check surveys to correct errors indicated by review of the field notebooks or otherwise detected.

1.3 SURVEYS FOR LAYOUT AND PERFORMANCE OF WORK

- A. The CONTRACTOR shall perform all surveys for layout and performance of the Work, make necessary calculations, and prepare drawings necessary to carry out such work.

B. Record Documentation Survey to include:

1. Location and area of excavation.
2. Location and elevations of ground surface at installed wells.
3. Location of replacement fence.
4. Limits of any disturbed areas caused by access.
5. Elevations of well head, well bottom, and geomembrane boot.

1.4 SURVEYS FOR MEASUREMENT FOR PAYMENT

A. When the Specifications require quantities of work to be measured by surveying methods, the CONTRACTOR will coordinate with the site surveyor to perform the surveys. The ENGINEER or DEP may independently perform the surveys. In the case of discrepancy, the ENGINEER or DEP measurement shall be used.

1.5 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

A. Control traverse field surveys and computations shall be performed to an accuracy of at least 1:25,000.

B. The tolerances generally applicable in setting survey stakes shall be as set forth below. Such tolerances shall not supersede stricter tolerances required by the Contract Drawings and Technical Specifications, and shall not otherwise relieve the CONTRACTOR of responsibility for measurements in compliance therewith.

Type of Line or Mark	Horizontal Position	Elevation
Permanent reference points	in 10,000	± 0.01-feet
General excavation and earthwork	in 2,000	± 0.03-feet

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION 01052

SECTION 01190

HEALTH AND SAFETY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. General requirements for the protection of Health and Safety of personnel involved in the project,
2. General requirements for furnishing services of a Site Safety Officer
3. General requirements for preparation of a Community Air Monitoring Program, and
4. Preparation of Safety Program

B. The provisions of this Section are supplementary to other provisions specified elsewhere in the Contract Documents.

C. The CONTRACTOR shall be familiar with the Safety Guidelines as prepared by the Solid Waste Association of North America (SWANA) National Landfill Gas Committee. Copies may be obtained by writing to SWANA, 8750 Georgia Avenue, Suite 140, Sever Spring, Maryland 20910, telephone number (301) 585-2898.

D. Nothing in this Section shall preclude the CONTRACTOR from complying with the more stringent requirements of the applicable Federal, State, County, DEP and Industry Standards, rules and regulations.

1.2 HAZARDOUS SITE CONDITIONS

A. The CONTRACTOR is advised that this project is being performed within, over and adjacent to buried wastes and refuse. As these buried materials decompose, they may generate landfill gas (LFG), which normally consists of methane (CH₄), carbon dioxide (CO₂), and occasionally hydrogen sulfide (H₂S) and other gases, depending on the composition of the buried materials. Additionally, the CONTRACTOR is advised that this project is being performed at a New York State Superfund Site, and is identified as a Class 2 Inactive Hazardous Waste Disposal Site by the NYSDEC.

1.3 POTENTIAL FOR HAZARDS

A. The following landfill and landfill gas related information is included to assist the CONTRACTOR in developing his Safety Program and is not intended to encompass all steps that may be necessary to protect the CONTRACTOR's workers and comply with applicable regulations. Prior to initiation of any field work, a copy of the CONTRACTOR's Safety Program shall be submitted to the DEP and to the ENGINEER for their information.

1. Landfill gases cannot vent to the atmosphere through the PBL cover system due to the existence of the geomembrane cap. The passive vent monitoring data indicates that methane is present within the gas collection layer directly below the geomembrane component of the cover system.
2. Landfill gases have the potential to create hazardous conditions if not controlled or recognized. Some of the hazards are:

1.4 SITE SAFETY OFFICER

- A. The CONTRACTOR shall be responsible for the health and safety of his worker and subcontractors. The Contractor shall provide a person who will be designated as the Site Safety Officer. The Site Safety Officer shall be thoroughly trained in rescue procedures, and in the use of safety equipment and gas monitoring/detection equipment. The Site Safety Officer shall be present at all times during working hours whenever open trenches or excavations are greater than 2-feet in depth, when refuse is exposed or when landfill gas is likely to be present (e.g., during drilling operations). The jobsite superintendent may not be assigned as the Site Safety Officer and during work requiring the Site Safety Officer, the designated person shall be dedicated to the assignment.
- B. Shoring or protection of excavations may be required. CONTRACTOR is responsible for all excavation protection at no cost to the DEP.
- a. Fires may start spontaneously from exposed and/or decomposing refuse.
- b. Fires and explosions may occur from the presence of methane gas.
- c. Landfill gases may cause an oxygen deficiency in underground trenches, vaults, conduits, and structures.
- d. Hydrogen sulfide, a highly toxic and flammable gas, or other toxic gas may be present.
- e. Possible caving of trenches and excavations when working over or in refuse fills.

- B. The CONTRACTOR shall submit the qualifications of the proposed Site Safety Officer subject to approval by the ENGINEER.
- C. The Site Safety Officer shall have appropriate instruments (detector[s]) to test for oxygen deficiency and for the presence of methane gas and hydrogen sulfide gas. The Site Safety Officer shall calibrate the instruments as required by the manufacturer and regularly monitor the excavation areas and other work spaces for safe working conditions and ensure that appropriate safety equipment is available at the Site.
- D. The Site Safety Officer shall have the delegated authority to order workers on the project Site to comply with the Site safety requirements and stop all work. Failure to observe the Site Safety Officers order shall be cause for removal of the worker from the project
- E. The Site Safety Officer will evacuate or not permit any workers to enter any excavated area where there is less than 19.5-percent oxygen, greater than 1.5-percent of methane, or greater than 10-parts per million by volume (ppmv) of hydrogen sulfide. The Contractors HASP plan can provide stricter limits.

1.5 SAFETY PROGRAM SUBMITTAL

- A. Supplemental to the CONTRACTOR regular safety program, the CONTRACTOR shall develop appropriate additions to address the impact of landfill gas in the work area and institute procedures to inform all workers, ground water treatment personnel and Site visitors of the potential for the presence of methane and other landfill gases emanating from the natural decomposition of refuse buried at or near the job site and the importance of safety precautions to ensure the safety of workers and the public. The CONTRACTOR shall also instruct all workers and maintain strict control of construction activities to protect and maintain the integrity of the work features as they are installed.

B. CONTRACTOR shall submit its safety program, to the ENGINEER prior to work at the Project Site.

C. The CONTRACTOR shall submit a site-specific HASP in accordance with OSHA requirements found at 29 CFR 1910.120 to Engineer 7 days before site mobilization. The CONTRACTOR may not mobilize until the ENGINEER and DEP approves the submittal.

1.6 SAFETY PRECAUTIONS

A. In addition to conforming to the safety rules and regulations of governmental authorities having jurisdiction, the CONTRACTOR shall take the following precautionary measures:

1. During construction, the workspace should be monitored for concentrations of oxygen, methane and hydrogen sulfide. Workers shall not be permitted to enter a workspace where there is an oxygen deficiency or a combustible mixture of gases without appropriate protection. Positive fan-forced ventilation to dilute gas mixtures and avoid oxygen deficiency should be provided when work is necessary in any workspace.
2. Smoking shall be prohibited in or near open excavations and workspaces, exposed refuse, and in the vicinity of well installation activities. The cap vegetation is not moved and presents a potential fire hazard. Smoking is prohibited on the landfill cap. Smoking will be permitted only in those areas designated by the Site Safety Officer.
3. In the event toxic gases are present at concentrations hazardous to the workers and other site personnel, the CONTRACTOR shall immediately evacuate all persons from the area until the area is determined safe by the Site Safety Officer.
4. Soil shall be stockpiled adjacent to work space in areas of exposed refuse for firefighting purposes.
5. The use of explosives or firearms shall not be permitted on the Site.
6. Refuse generated from PBL landfill waste may be encountered during gas well drilling. Such refuse shall not be accumulated in the construction area for a period extending beyond the day on which it was generated.
7. Temporary staging of the daily accumulation shall be maintained completely upon barrier material such as poly sheeting and shall be covered with poly sheeting as needed to control odors. If odors cannot be controlled by covering the refuse with poly sheeting, CONTRACTOR shall implement other measures as needed, subject to approval by the ENGINEER. The refuse from well drilling shall be placed by CONTRACTOR in roll-off containers in the lay down area (on property but not on landfill cap) and covered by the CONTRACTOR with roll-off tarp before the end of Work each day.
8. No welding shall be permitted in excavation areas, enclosed areas, or over refuse unless performed in areas of the Site tested and approved by the Site Safety Officer.
9. Combustion engine powered construction equipment used in excavating activities and/or drilling operations shall be equipped with vertical exhaust and spark arrestors.
10. Electric motors and controls utilized in excavation areas shall be explosion-proof.

11. As construction progresses, all pipe openings and valves shall be closed as soon as installed to prevent the migration of gases through the pipeline systems.

1.7 Community Air Monitoring Program (CAMP)

A. In accordance with NYSDEC DER-10 guidance, prior to initiation of any intrusive work, the CONTRACTOR will develop and implement a CAMP. Prior to use, the draft CAMP must be provided to the DEP and ENGINEER for review.

END OF SECTION 01190

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: General requirements for preparation and submission of the following submittals required for the completion of the Work of the Contract.

1. Submittals Requiring Approval:

- a. Schedule of Submittals
- b. Manufacturer's Instructions
- c. Certificates of Compliance
- d. Schedule and Reports
- e. Project Construction Schedule
- f. Equipment List and Labor Rates
- g. Safety Program

2. Submittals Not Requiring Approval:

- a. Weekly Status Report

B. All submittals shall be in English.

C. The CONTRACTOR shall submit all submittals to the ENGINEER.

D. The CONTRACTOR shall submit the number of copies of each submittal that the CONTRACTOR requires to be returned, plus three (3) copies that will be retained by the ENGINEER.

E. The ENGINEER will clearly label the submittals as follows and return to the CONTRACTOR:

1. Approved
2. Approved as Noted
3. Revise and Resubmit
4. Rejected
5. Information Only

F. When submittals are returned marked with "Revise and Resubmit" or "Rejected", the CONTRACTOR shall make such revisions and corrections as required and resubmit the submittal with the same submittal number followed by Rev-01, for example: S-1 Rev-01.

1.3 SUBMITTALS REQUIRING APPROVAL

A. Schedule of Submittals:

1. The CONTRACTOR shall prepare and submit a Technical Submittals Schedule (i.e. submittal log) listing all technical submittals required by these technical specifications. The Contractor will submit the completed log to the ENGINEER 10 days after the project award.
2. The Technical Submittals Schedule shall designate submittals by major specification section. This Schedule shall include submittal delivery dates, required return dates, material delivery dates, and other pertinent data required to ensure that the CONTRACTOR meets the project schedule.

B. Manufacturer's Instructions: When required by the manufacturer's warranty requirements, the CONTRACTOR shall submit manufacturer's printed instructions for delivery, storage, shelf life, assembly, installation, adjusting, and finishing.

C. Certificates of Compliance:

1. The CONTRACTOR shall submit certificates of compliance for certain materials and products in lieu of the specified sampling and testing procedures as specified in each Technical Specification section. Submit certificates required for demonstrating proof of compliance of materials with specification requirements in duplicate with each lot of materials delivered to the Work. The lot so certified shall be clearly identified by the certificate. Certificates shall be signed by an authorized representative of the producer or manufacturer and shall state that the material complies in all respects with the requirements of the Contract Documents. In the case of multiple shipments, each shipment shall be accompanied by a certificate of compliance.

2. The certificate of compliance shall be accompanied by a certified copy of test results or shall state that such test results are on file with the producer or manufacturer and shall be furnished to the ENGINEER on request. The certificate shall give the information specified for samples in Paragraph C above, the name and address of the organization performing the tests, the date of the tests, and the quantity of material shipped.

3. Materials used on the basis of a certificate of compliance may be sampled and tested at any time. The fact that material is used on the basis of a certificate of compliance shall not relieve the CONTRACTOR of responsibility for incorporating material in the Work that conforms to the requirements of the contract and any such material not conforming to such requirements will be subject to rejection, whether in place or not.
4. The ENGINEER reserves the right to refuse to permit the use of certain materials on the basis of a certificate of compliance.

D. Schedules and Reports:

1. The CONTRACTOR shall prepare and submit Schedules and Reports in accordance with the requirements of this Section.
2. The schedules and reports shall describe the CONTRACTOR's work plan in sufficient

detail as delineated below to provide:

- a. Assurance to the ENGINEER that the finished work complies accurately with the Contract Documents,
 - b. A basis for determination the progress of the work, and
 - c. A basis for the internal planning activities.
 3. Within ten (10) calendar days after Notice to Proceed, the CONTRACTOR shall provide the ENGINEER with initial copies of the Submittals specified in this Section.
 4. Unless otherwise specified, the schedule shall be presented in graphic format and transmitted to the ENGINEER.
 5. The CONTRACTOR shall obtain approval of the various schedules specified in this Section before submitting the first application for payment. Schedule revisions also require ENGINEER approval.
 6. A completion report and a survey report should be submitted within 2 weeks of the completion of the project.
- E. Project Construction Schedule:
1. Scheduling: A preliminary issue of the Project Construction Schedule shall be prepared by the CONTRACTOR and submitted with the bid. Two (2) days after receipt of Notice to Proceed, the CONTRACTOR shall submit the Project Construction Schedule for approval and issue the approved Project Construction Schedule ten days after receipt of approval and comments from the ENGINEER.
 2. Format: The Project Construction Schedule shall consist of the following items, each compatible with the other and developed from the same basis:
 3. Critical Milestone Dates as listed below.
 - a. Start/complete mobilization.
 - b. Start/complete installation of the landfill gas wells.

- c. Start/complete excavating, backfilling, and compacting.
- d. Start/complete final inspection.
- e. Start/complete demobilization.

F. Equipment List and Labor Rates:

1. The CONTRACTOR shall submit Equipment List and Labor Rates Schedule for use in conjunction with any Force Account Work done on a time *and* material basis, to determine compensation to the CONTRACTOR.
2. The schedule shall include all equipment and personnel that the CONTRACTOR expects to use on this project. It shall also include any other equipment and personnel that the CONTRACTOR has available that may be used on the Project.
3. The rate shall include all costs and constitute full payment to the CONTRACTOR for use of operated equipment and personnel. This list shall be submitted with the bid.

G. Safety Program:

1. The CONTRACTOR for presentation and discussion at the pre-construction meeting shall prepare a preliminary Safety Program. The CONTRACTOR's Site Safety Officer shall be named and be present at the pre-construction meeting. Although the Safety Program will not be formally approved, the OWNER or ENGINEER may review and comment of its adequacy.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION 01300

SECTION 01505

MOBILIZATION & DEMOBILIZATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mobilization consists of preparatory work and operations, including but not limited to, those necessary for the movement of personnel, project health and safety, project security including adequate personnel, equipment, supplies, and incidentals to the project site; for the establishment of offices, buildings, and other facilities necessary for work on the project; for premiums on bond and insurance for the project and for other work and operations the CONTRACTOR must perform or costs the CONTRACTOR must incur before beginning work on the project, which are not covered in other bid items.
- B. Demobilization consists of work and operations included but not limited to, those necessary for movement of personnel, equipment, supplies, incidentals, and offices off site.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION 01505

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PART 1 - GENERAL**1.01 DESCRIPTION**

A. The Work covered by this Section consists of furnishing all materials, labor, tools, equipment and transportation necessary for all construction as it pertains to the excavating, stockpiling, backfilling, compacting, grading, preparation of a working platform for the installation of LFG extraction wells, and access road completion associated with the LFG extraction well replacement work.

B. The CONTRACTOR is responsible for returning the site to the pre-existing condition following completion of work and meeting the requirements in the drawings and specifications.

C. The Work shall include, but not be limited to, the following activities:

1. Excavating and backfilling of trenches or small excavation;
2. Foundation (for re-installation or replacement of fencing associated with the Landfill Gas Replacement Extraction Wells) preparation and site grading;

3. Stockpiling soils;

4. Furnishing or re-use, preparing, hauling, testing, placing and compacting structural fill;

5. Furnishing or re-use, preparing, hauling, testing, placing and compacting protective cover;

6. Furnishing or re-use, preparing, hauling, testing, and placing topsoil; and,

7. Preparing earthwork for the installation of all structures and systems.

D. No soils shall be removed from the site unless otherwise instructed or approved by the ENGINEER. Every effort shall be made to re-use cover materials removed/excavated from above the geomembrane composite liner. Additionally, every effort should be made to return/bury underneath the geomembrane composite liner, any materials that were removed/excavated from below the geomembrane composite liner.

E. All soil types shall consist of material approved by the ENGINEER from off-site sources which have previously been accepted, and/or approved materials removed from stripping or excavation. Further, in accordance with the PBL Site Management Plan, any materials import on-site must meet the Restricted-Residential Use Soil Clean-Up Objectives. During construction, the construction area shall be well

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drained. No materials shall be backfilled when either the material or the surfaces on which it is to be placed is frozen, excessively wet or soft. When the Work is interrupted by heavy precipitation or freezing temperatures, fill operations shall not be resumed until the ENGINEER determines that the moisture content, density and integrity of the previously-placed soils are as specified.

1.02 DEFINITIONS

- A. "Protective cover" includes those soils utilized above geosynthetics or other soil layers to protect the underlying components.
- B. "Topsoil" includes soils that shall be utilized at the fill surface to support vegetative growth.

1.03 RELATED WORK

A. Section 01010 SUMMARY OF WORK

B. Section 01025 MEASUREMENT AND PAYMENT

C. Section 01190 HEALTH AND SAFETY

D. Section 02711 GEOTEXTILE

E. Section 02712 GEOCOMPOSITE

F. Section 02713 SYNTHETIC MEMBRANE

G. Section 02670 LFG EXTRACTION WELLS AND WELTHEADS

1.04 REFERENCES

- A. ASTM D-422 Particle-Size Analysis of Soils
- B. ASTM D-698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lb./ft³)
- C. ASTM D-1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- D. ASTM D-1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-Inch Drop.

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E.	ASTM D-2216	Standard Method for Laboratory Determination of Water Content of Soil, Rock, and Soil-Aggregate Mixtures
F.	ASTM D-2487	Classification of Soils for Engineering Purposes
G.	ASTM D-2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
H.	ASTM D-3017	Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
I.	ASTM D-4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.05 QUALITY ASSURANCE

- A. All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications, and shall be subjected to strict quality control monitoring as detailed herein. The placed fill soils shall conform exactly to the Drawings and Specifications, except as otherwise authorized in writing by the ENGINEER.
- B. The CONTRACTOR shall comprehend and anticipate the Construction Quality Assurance (CQA) activities and account for these activities in the installation schedule.

1.06 SUBMITTALS

- A. The CONTRACTOR shall submit to the ENGINEER for review the proposed methods of construction, including excavation, filling, compaction, and backfilling for the various portions of the Work. Review shall be for method only. The CONTRACTOR shall remain responsible for the adequacy and safety of the methods.
- B. The CONTRACTOR shall submit to the ENGINEER a Stockpiling Plan prior to commencement of earthwork activities. The plan shall indicate the location and contents of each stockpile.
- C. The CONTRACTOR shall submit a 50-pound sample from each of the off-site borrow pits proposed to furnish the required quantity of general fill materials. The samples shall be submitted to the ENGINEER no less than two weeks prior to the

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D. The CONTRACTOR shall submit the results of the ASTM tests listed below for each borrow pit location and designated soil classification to verify that the soil materials meet the technical requirements of Section 02200. Test results are not required if the existing topsoil and protective cover soil are used as backfill.

D. The CONTRACTOR shall submit the results of the ASTM tests listed below for each borrow pit location and designated soil classification to verify that the soil materials meet the technical requirements of Section 02200. Test results are not required if the existing topsoil and protective cover soil are used as backfill.

PARAMETER	ASTM TEST	FREQUENCY FOR CQC	FILL CLASSIFICATION
METHOD			
TESTING			

Moisture Content	D-2216	One per Source	Protective Cover, Topsoil
Soil Classification	D-2487	One per Source	Protective Cover, Topsoil
Particle-Size Analysis	D-422	One per Source	Protective Cover, Topsoil
Modified Proctor	D-1557	One per Source	Protective Cover
Atterberg Limits	D-4318	One per Source	Protective Cover, Topsoil
pH	D-4972	One per Source	Topsoil
Organic Content	D-2974	One per Source	Topsoil

1.07 SOIL TESTING

A. Prior to the general placement of the fill, and during such placement, the ENGINEER shall select areas within the limits of the fill for testing the degree of compaction obtained. The CONTRACTOR shall be responsible for the cost of all quality control testing. The CONTRACTOR shall cooperate fully to allow the ENGINEER to perform supplemental quality assurance testing.

B. Payment for any supplemental in-place quality assurance testing verification will be made by the ENGINEER. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the ENGINEER and any additional costs for retesting will be borne by the CONTRACTOR.

A. If trenches, diversion ditches, or other activities require excavations, they shall be cut accurately as directed by the ENGINEER. All rock and foreign matter in the sides and bottom of excavations shall be removed. Excavations and filling shall

3.1 GENERAL

PART 3 - EXECUTION

Topsoil shall consist of loose, friable, and loamy soil material (loam, sandy loam, silty loam, sandy clay loam, clay loam) and shall be free of debris, trash, stumps, rocks, roots, and weeds. Vegetative soil shall be able to support healthy vegetation and shall not contain substances which may be toxic to humans or plants. The fraction of particles passing through the 10-mesh sieve shall not contain more than 40 percent clay. No particle shall be larger than 2". Organic matter content shall be greater than 3.75 percent but less than 20 percent by weight, and pH shall be within the range 6.0 and 8.0. Lime shall be added appropriately if the pH is less than 6.0.

2.2 TOPSOIL

Common borrow shall be used as the protective cover layer. It shall be free from organic materials, loam, wood, trash, and other objectionable materials which may be compressible or which cannot be properly compacted. Protective cover shall have a maximum plasticity index of 40 and shall be classified according to the Unified Soil Classification System (USCS) as SP-SM, SM, SC, or ML. Protective cover shall not contain material larger than one (1) inch in the first 12-inch thick lift immediately above any geosynthetic material. The protective cover shall not contain material larger than three (3) inches in any other lifts. Protective cover shall not contain sound rock, broken concrete, masonry rubble, or other similar materials. It shall have physical properties such that it can be rapidly spread and compacted during filling. Snow, ice and frozen soil shall not be permitted.

2.1 PROTECTIVE COVER

PART 2 - MATERIALS

C. The testing frequency required in Paragraph 1.06 of this Section may be increased at the discretion of the ENGINEER when visual observation or construction performance indicates a potential problem.

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conform to the slope, grade, and shape of the section shown. Care shall be taken not to excavate below the grades indicated. Excessive excavation shall be backfilled to grade with suitable, thoroughly compacted fill material as directed by the ENGINEER with no additional cost to the OWNER. Any required shoring activities shall be conducted in accordance with local, state and federal codes, and is approved by the ENGINEER. All trenches, ditches, and structures excavated under this Section shall be maintained until final acceptance of the Work.

- B. If the moisture content of the fill material is outside the acceptable range, the soil shall be wetted or dried, as appropriate.
- C. Any delays in progress due to wetting or drying of soil are the responsibility of the CONTRACTOR.

- D. Soils placed in fill areas shall be graded to smooth true lines, strictly conforming to the grades indicated on the Drawings, or as otherwise approved by the ENGINEER.
- E. The CONTRACTOR shall subcontract a Professional Land Surveyor registered in the City of New York to certify that all soil material has been placed to the lines, grades, and elevations presented on the Drawings. The CONTRACTOR may use in-house personnel for the certification, provided the certification is performed by a surveyor registered in the City of New York.

- F. Fill materials shall be placed in such a manner as to facilitate drainage at all times. Ponding of surface-water run-off shall not be permitted.
- G. If compaction or other tests indicate that any portion of the Work does not meet the specified requirements, then the CONTRACTOR shall remove that section, replace and re-compact at no additional cost to the DFP. Determinations of the extent of removal and the acceptability of the in-place fill materials shall be made by the ENGINEER.

- H. If significant precipitation causes wet conditions, placement and compaction activities shall be terminated until the conditions have dried sufficiently to continue according to the ENGINEER.

- I. Equipment or vehicles shall not be allowed to travel in a single track or form ruts. Any ruts or irregularities formed shall be scarified and re-compacted by the CONTRACTOR at its expense as required and directed by the ENGINEER.

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J. Inspection:

1. Prior to implementing any of the Work in this Section, the CONTRACTOR shall carefully inspect the installed Work of all other Sections and verify that all Work is complete to the point where the Work of this Section may properly commence without adverse impact.
2. If the CONTRACTOR has any concerns regarding the installed Work of other Sections, the CONTRACTOR shall notify the ENGINEER in writing. Failure to notify the ENGINEER prior to conducting Work within this or other Sections shall be construed as the CONTRACTOR's acceptance of the related Work of all other Sections.

- K. The CONTRACTOR shall protect on-going and completed work from precipitation, excessive heat, freezing, and other elements to avoid compromising the integrity of prior Work. Prior Work affected by such conditions shall be repaired by the CONTRACTOR at no additional cost to the OWNER.

3.2 EXCAVATION

- A. Excavation shall be made to the grade of geocomposite layer shown on the Drawings. Care shall be exercised when stripping or removing soil so as to prevent over-excavation.
- B. All excavation activities shall be conducted in compliance with all applicable OSHA regulations.

3.3 BACKFILLING

A. Protective Cover

1. Protective cover soil material shall meet the requirements of Part 2.2 of this Section.
2. Protective cover soil shall be placed in 12-inch compacted lifts. The remaining compaction of the protective cover shall be accomplished by any appropriate means required to achieve the minimum in-place densities as long as it will not damage the underlying geosynthetics.

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3. Protective cover soil shall be compacted to as required by the OMM&M Plan, or as otherwise approved by the ENGINEER.

B. Topsoil

1. Topsoil shall meet the requirements of Part 2.05 of this Section. Soil mixing is permitted to achieve the desired characteristics. Soil mixing shall be conducted prior to placing the material, and the mixed material shall be tested in accordance with this Section.

2. All ground areas disturbed by construction during this project and not built over, paved or otherwise surfaced shall be covered with vegetative soil.

3. Prior to placing topsoil, vegetation shall be removed from the area and the ground surface cleared of all other materials that would hinder proper grading, tillage or subsequent maintenance operations.

4. Previously-constructed grades shall be repaired, if necessary, so that the areas to be covered with vegetative soil shall conform to the section indicated on the Drawings upon completion of vegetative soil placement.

5. Subsequent to grading, the areas to be covered with topsoil shall be thoroughly scarified by approved means to a depth of at least 3 inches for bonding of vegetative soil with the subsoil. The Work shall be performed only during periods when beneficial results are likely to be obtained, i.e. when conditions are such, by reason of drought, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the Work will be stopped by the ENGINEER and shall be resumed only when directed. Undulations or irregularities in the surface that would interfere with further construction operations or maintenance shall be leveled before the next specified operation.

6. The vegetative soil layer shall be uniformly distributed on the designated areas and evenly spread to a minimum loose thickness of 6 inches. The spreading shall be performed in such manner that planting can proceed with little additional soil preparation or tillage. The surface resulting from placing topsoil shall meet the final grades as indicated on the Drawings. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or the proposed planting.

3.4 EXCESS MATERIALS

- A. No excavated materials shall be removed from the site, except as specified or approved by the ENGINEER. All general waste or debris shall be containerized on-site and periodically disposed off-site in accordance with these Specifications.

- B. Suitable materials, as determined by tests discussed in these specifications, shall be classified and stockpiled in approved areas for immediate or future use.

- C. Stockpiles shall be graded to drain; no surface-water ponding is permitted on stockpiles. Stockpiles may be covered with plastic sheeting or other material to preserve the soil integrity. Proper erosion controls; i.e., silt fence, shall be installed at the perimeter of the stockpile.

3.5 GRADING

- A. Uneven areas and low spots which may develop in the stripping and grading operations shall be eliminated via minor excavations or placement of appropriate fill materials. Levels, profiles and contours of the site configuration shall be maintained as established on the Drawings.

- B. The areas to be backfilled shall be uniformly graded to within the limits of grading under this Section. A smooth finished surface shall result within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades to the satisfaction of the ENGINEER.

- C. Constructed slopes shall be blended into existing undisturbed areas gradually in order to provide neat, clean transition zones. Feathering of constructed slopes into existing grades shall be accomplished to promote natural drainage and to eliminate possible surface-water ponding.

- D. The right is reserved by the ENGINEER to make minor adjustments or revisions in lines or grades if found necessary as the Work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction. Any suspected discrepancies shall be reported to the ENGINEER as soon as detected.

3.6 CRITERIA AND TOLERANCES

- A. Compaction and moisture content criteria and tolerances are discussed in Part 3.3 of this Section.
- B. Final grades shall be within two tenths of one (0.2) foot below to two tenths of one (0.2) foot above (-0.2 to +0.2) the grades and contours indicated on the Drawings, or as dictated by changed field conditions, and approval by the ENGINEER.

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- C. In recognition of the moisture-density relationship of soils, the ENGINEER may direct that the compaction and moisture content tolerances be modified if required by variability in the soils. This decision, if required, will be based on the ENGINEER's interpretation of the laboratory analyses for each soil.
- D. No additional payment will be made for quantities of soils placed in excess of that amount required to achieve the minimum specified thickness.

3.7 FIELD QUALITY CONTROL

- A. The CONTRACTOR shall test the in-place density and moisture content of the protective cover and structural fill in accordance with ASTM D-2922 and ASTM D-3017, respectively and these Specifications. The testing shall be conducted at a frequency of not less than five (5) tests per acre per lift. All test locations shall be surveyed, recorded, and provided on the "As-Built" drawings.
- B. The CONTRACTOR shall provide access and repair any damage to subgrade caused by all performed tests, and cooperate in other ways necessary to permit the ENGINEER to conduct testing when and where he/she desires and as expeditiously as possible.
- C. Fill material shall not be placed over a lift which has not been tested and approved by the ENGINEER.

END OF SECTION

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Work covered by this Section consists of furnishing all materials, equipment, tools and labor to construct and maintain erosion and sediment control systems.
- B. The Work to be performed includes, but is not limited to the installation or silt fences, straw bales, erosion mat, and seeding as specified herein and as shown on the Drawings.
- C. Provide temporary controls to prevent erosion, sedimentation, and dust.
- D. Provide erosion mat to protect disturbed areas from the erosive effect of rainfall and prevent sheet erosion during the establishment of grass or other vegetation, and to reduce soil moisture loss due to evaporation.
- E. Maintain all controls.

1.02 RELATED WORK

B.	Section 01025	MEASUREMENT AND PAYMENT
C.	Section 01300	SUBMITTALS
D.	Section 02200	EARTHWORK

PART 2 - PRODUCTS

2.01 EROSION AND SEDIMENT CONTROL MATERIALS

- A. Silt Fence: the CONTRACTOR shall supply silt fence to control surface-water runoff and sediment. Acceptable silt fence material shall meet or exceed the criteria provided in Table 02290-1.
- B. Erosion Mat: The CONTRACTOR shall place erosion mat in the locations specified on the Drawings. The erosion mat shall be used prior to the establishment of vegetation and placed in areas with potentially-high, concentrated surface-water flow as designated by the ENGINEER. The erosion mat shall be a blanket providing open space for vegetative growth and shall be of the type indicated on the Drawings or equivalent.

EROSION AND SEDIMENT CONTROL

PART 3 - EXECUTION

3.01 TRANSPORTATION, HANDLING AND STORAGE

- A. Materials shall be handled in such a manner as to prevent damage to the material. Materials shall not be dropped or dragged over the ground. Any materials damaged shall be replaced at no expense to the DEP.

3.02 EROSION AND SEDIMENT CONTROL STRUCTURES

- A. Silt Fence: The CONTRACTOR shall install silt fence in accordance with the specifications and installation instructions provided by the manufacturer or as shown on the Drawings, or as directed by the ENGINEER. Presiding authority shall be as follows, in descending order: ENGINEER's direction, Drawings, Specifications, manufacturer's installation instructions. The CONTRACTOR shall maintain the silt fence until permanent vegetation is established.

- B. Erosion Mat:
1. The seedbed for erosion mat placement shall be free of rocks or clods greater than 1.5 inches in diameter, contain a minimum of 6 inches of topsoil, and shall be graded to ensure uniform soil contact with the erosion mat.
 2. The sod staples used to hold the erosion mat against the soil shall be 6 to 10 inches in length of No. 11 gauge or heavier wire.
 3. The top end of the erosion mat shall be firmly anchored in a 6-inch trench.
 4. When joining two rolls together, the new roll shall be anchored in a 6-inch trench and the previous roll shall be overlapped 18 inches.
 5. Adjacent erosion mat strips shall be overlapped 4 inches and stapled on 18 inch centers.
 6. The outside edges of the erosion mat shall be stapled on 2 foot centers.
 7. The staple pattern shall be as indicated on the Drawings.
 8. The CONTRACTOR shall adhere to any other installation guidelines specified by the manufacturer or deemed appropriate by the ENGINEER.

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EROSION AND SEDIMENT CONTROL

Table 02290-1

SILT FENCE PROPERTIES¹

PROPERTIES	QUALIFIER	SPECIFIED VALUE	TEST METHOD
Grab Tensile Strength	minimum	90 lb.	ASTM D-1682
Mullen Burst Strength	minimum	190 psi	ASTM D-3786
Flow Rate	maximum	0.3 gal/min/ft ²	
Equivalent Opening Size		40-80	US Std - Sieve CW- 02215
Ultraviolet Radiation Stability	minimum	90%	ASTM G-26

END OF SECTION

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SECTION 02670

LANDFILL GAS EXTRACTION WELLS & WELLHEADS

PART 1 - GENERAL

1.1. DESCRIPTION

- A. Scope of Work: The CONTRACTOR shall provide all equipment, materials, and labor needed to install replacement landfill gas (LFG) extraction wells and wellheads as specified herein and as indicated on the attached drawings, remove the existing fence that surrounds the extraction wells, replacement of the fence after completion of the LFG extraction wells, and repair of the cover system.

- B. General work included in this Section: The drilling and installation of landfill gas vertical extraction wells and at the locations shown on the Contract Drawings. CONTRACTOR shall provide and install temporary soil benches on the landfill slopes to install vertical wells.

- C. Work includes staging of well drill cuttings (mixed waste from the landfill) in a watertight container(s) provided by the CONTRACTOR. If feasible, drill cuttings generated from beneath the geomembrane composite liner should be returned to beneath the liner. If the volume drill cuttings does not permit on-site return to beneath the liner, the characterization and disposal of the drill cuttings shall be the responsibility of the CONTRACTOR. No off-site disposal is permitted without approval of the DEP, Engineer, and NYSDEC.

- D. Related Sections include but are not necessarily limited to:
1. Section 01190 — Health and Safety
2. Section 01300 — Submittals

- E. It is expected that combustible methane gas will be venting from boreholes drilled to install the extraction wells. The CONTRACTOR'S bid price shall include provision for all equipment and procedures necessary to safely install wells under this condition. The CONTRACTOR is responsible for all health and safety associated with their work or their subcontractor's work and shall submit a project specific health and safety plan and a community air monitoring program for review and approval prior to commencement of work.

1. An on-site area will be designated by the OM&M CONTRACTOR for decontamination of the drill rig and drilling equipment.
2. The CONTRACTOR shall provide/construct a heavy-duty lined decontamination pad of sufficient size to accommodate contamination of all fluids generated during decontamination of the drilling rig, tools, and ancillary equipment.
3. Prior to the drilling of the first borehole, and after the drilling, installation of each well, the CONTRACTOR shall decontaminate all drilling bits, rods, tremie pipes, and any other tools to be used in the drilling and well installation operations.
4. The CONTRACTOR shall have a steam-cleaning unit on the work site to be used for decontamination of his equipment.

C. Decontamination of Equipment

1. Attend the Safety orientation.
2. The Drilling crews will unload trucks and set up staging area as directed by the Site Project Engineer.
3. The Drilling crews shall review all required site safety equipment requirements and calibrate and check the required equipment prior to set-up at the drill sites.
4. The Drilling supervisor and all appropriate crew members shall attend a pre-construction meeting.

B. Set up and pre-construction meeting

1. Mobilization will include Drill Rig, Excavator, Off-Road Truck and Water Truck.
2. Mobilization will also include materials needed to complete vertical extraction wells (pipe, valves, caps, and bentonite).
3. Mobilization will include stone and soil backfill for temporary soil benches, vertical extraction wells.

A. Mobilize to the project Site.

1.3. SITE STANDARD DRILLING PROCEDURES

1. Relevant notations and verification of activities.
2. CONTRACTOR will provide copies of Drillers Reports, Vertical Extraction Well and Condensate Drainage Sump Logs and Vertical Extraction Well Installation Logs for review and approval by the designated representative prior to initiation of well construction.
3. CONTRACTOR shall provide copies of the Detailed Vertical Extraction Well Installation logs for review and approval by the designated representative prior to initiation of vertical extraction well construction.

q. Casing elevation,

5. The volume of water generated during decontamination is expected to be minimal. There will be no disposal of water without NYCDEP approval. If a sufficient volume of water is generated that requires disposal, it is anticipated that the water will be disposed of into the site leachate collection system after NYCDEP approval.

D.

Drill Rig staging and vertical extraction well site set-up.

1. The CONTRACTOR'S Drilling Supervisor and the Project Representative will check the staked locations for accuracy and depth.
2. The aforementioned personnel shall sign an "approval form" agreeing on the location accuracy and proposed depth prior to initiating the drilling.

3. The Drilling crews will build bench or platform if required, move the Drill Rig and all other required equipment to the site, set up a spoils container, and stage the First aid station/Fire extinguisher/Eyewash/and any other needed supplies. A litter fence will be moved from drill site and deployed in a semicircle around the well.
4. The drilling crews will continually mist the area around the borehole or apply other odor controls approved by the ENGINEER, but keep far enough away as to not make the area around the borehole a slip hazard.

E.

Drilling and Completion of Vertical Extraction Wells

1. As drilling commences the drilling crew will haul spoils and refuse in a timely manner to the staging area. Odor neutralizing product will be applied directly to the spoils, as needed to suppress any fugitive odors.
2. An LBL/02/meter will be tested, calibrated if outside of parameters (Daily — Records available for review) and utilized for continuous monitoring for safety.

3. As the drilling proceeds the drilling crews will prepare the vertical extraction well casings and bentonite for a timely completion for the vertical extraction well when the desired drilling depth is reached. While drilling the crew will also proceed to the next vertical extraction well to build appropriate working platforms if necessary.

4. While the completion crew is completing the first vertical extraction well the driller will proceed to the next well for set up and a timely initiation of drilling on the second vertical extraction well.
5. Completion crews won't move to the next well until well boots, sleeves and bentonite slurry are completed. A liner crew will install a boot as soon as possible.
6. When drilling through lined area, the drilling crew will use an excavator to expose a minimum of 6-feet by 6-feet area.

7. Any vertical extraction well that is started shall be completed the same day/shift and temporarily closed or covered connected to a vacuum source. Temporary connections are allowed overnight but a permanent connection

- A

Backfill Materials:

1.

Gravel fill shall be between 1 inch and 1.5 inches in diameter (unless otherwise noted on the drawings), and shall be composed of clean, washed, hard and durable material, free of silt, clay, dirt, vegetation and other objectionable matter. Gravel shall be non calcium carbonate material.

2.

Soil backfill material shall be clean well graded granular fill free of stones larger than 1-inch, construction debris, refuse, muck, soft clay, loam, sponge material, vegetation/organic matter, or angular rock.

3.

"Bentonite Seal" as shown on the Drawing 2, shall refer to a well seal comprised of hydrated sodium bentonite pellets or chips of a thickness indicated on the drawing. Bentonite material shall consist of clay greater than 85% sodium montmorillonite, without additives.

B.

Perforated High Density Polyethylene Pipe (HDPE): The piping shall be as SDR-17 HDPE (PE 3408); 8 inch diameter. The slots in extraction well piping shall be as shown on the drawings and may be field-fabricated or supplied by the factory.

C.

Solid High Density Polyethylene Pipe (HDPE) Rigid Pipe for Riser.

2.1 MATERIALS

PART 2 - PRODUCTS

- F.

Waste Container

1.

Prior to mobilization, the CONTRACTOR shall submit detailed information regarding the size, type and proposed location of the waste container for drill cuttings.

2.

The container shall be approved by the manufacturer to hold municipal waste.

3.

The ENGINEER shall approve the container type and location.
8.

All drilling refuse will be delivered to the staging area and covered to prevent odors and wind-blown debris by 4:00 P.M. and heavy equipment shall be shut down no later than 5:00 P.M.
9.

The driller will keep a daily and well log that will be signed off on at the end of each day by the ENGINEER.
10.

During all drilling and completions the drilling crews will insure the equipment and areas are kept clean/ neat and orderly. Work site areas will be graded and completed in a "Better than found" condition daily.
11.

Drilling and support equipment will be cleaned and decontaminated prior to demobilization from the drilling sites. Additional cleaning and decontamination will be completed prior to leaving the property.
- F.

Waste Container

1.

Prior to mobilization, the CONTRACTOR shall submit detailed information regarding the size, type and proposed location of the waste container for drill cuttings.

2.

The container shall be approved by the manufacturer to hold municipal waste.

3.

The ENGINEER shall approve the container type and location.

- D. Wellhead Assembly for extraction wells shall be a pre-fabricated unit consisting of a 3-inch gate valve, 3-inch union disconnect, an impact pilot tube suitable for flow measurements, adapter bushing or other approved reducer fitting, temperature gauge, impact and static pressure ports, and dust caps. Wellhead assembly shall be manufactured by CES-Landtec, or approved equal.

PART 3 - EXECUTION

3.1 DRILLING

- A. The CONTRACTOR shall coordinate the start of drilling with the ENGINEER.
- B. The CONTRACTOR shall provide a thoroughly experienced, competent driller during all drilling operations. The driller shall be licensed in New York.
- C. The CONTRACTOR shall survey and stake the well locations prior to drilling. Well locations will be approved and may be adjusted by the ENGINEER or the OWNER prior to beginning drilling.
- D. The CONTRACTOR must use dry drilling equipment. Wet rotary drilling equipment may not be used.
- E. Wells are to be drilled to the depth and diameter as shown on Drawing 2. The boring depths shown on Drawing 2 are estimated and may be adjusted in the field by the ENGINEER.

1. Wet Borings on landfill:

- a. If water is encountered in a boring, the CONTRACTOR may be directed to drill beyond the point at which it was encountered. If wet conditions remain, the boring may be terminated and the length of perforated pipe adjusted by the ENGINEER. If wet conditions cease (e.g., due to a perched water layer), then drilling will continue to the design depth.
- b. If water is encountered in a boring at a shallow depth, the ENGINEER may decrease the well depth and length of perforated pipe, or relocate the well.

2. Abandoned Borings: If, in the opinion of the ENGINEER, the borehole has not reached a sufficient depth to function as an effective extraction well, the CONTRACTOR shall abandon this borehole by backfilling it with cuttings removed during drilling. If cuttings are unsuitable as backfill (for example, box springs, tires, etc.) the CONTRACTOR shall use soil backfill material. A 2-foot thick bentonite plug will be placed in the borehole when the depth is 4 feet below the existing liner. The remaining

2 feet of the borehole will then be filled with soil material and compacted to approximately match the elevation of the existing grade. Compensation for abandoned borings shall be at 1/3 the unit price for this pay item.

3. If the ENGINEER adds or deletes a well, or adjusts the depth of a well, either less than or greater than the depth shown on the well schedule, the CONTRACTOR will be compensated or will credit the OWNER per foot of variance according to the unit price for this pay item.

4. The bore for the well shall be straight and the well pipe shall be installed in the center of the borehole. The CONTRACTOR shall take all necessary precautions to maintain the well pipe vertically plumb during the backfill operation of the bored hole to the satisfaction of the ENGINEER. If the pipe installed is out of plumb, as determined by the ENGINEER, the CONTRACTOR, at his own expense, shall correct the alignment.

F. The CONTRACTOR shall keep detailed well logs for all wells drilled, including total depth of well, the static water level, the depth, thickness, and description of soil or waste strata, the occurrence of any water bearing zones. The logs shall also include detailed well construction diagrams for all wells installed. These diagrams shall include dimensions that indicate total well depth, length of slotted pipe, length of solid pipe, length of stick-up to the top of the wellhead, thickness of stone, thickness of bentonite plug, and thicknesses of soil material. Well logs shall be submitted to the ENGINEER.

3.2 JOINING OF PIPES

A. Pipes shall be joined by welding/fusion or as approved by the Engineer.

3.3 BACKFILLING

A. Backfilling of the well shall commence immediately after well drilling is completed and the well piping has been installed. Backfill materials shall be placed carefully within the wells to the dimensions shown on Drawing 2 and as approved by the ENGINEER. The ENGINEER, on the basis of a visual examination, may reject gravel and soil backfill containing foreign material. Both well piping and backfill shall be installed with a safety grate installed over the boring as approved by the ENGINEER.

B. The bentonite seal shall be backfilled in 6-inch lifts. Prior to placing each lift, the CONTRACTOR shall soak the in-place bentonite in accordance with manufacturer recommendations.

C. Soil backfill shall be rodded in the boring to provide even distribution and compaction.

- A. All drill cuttings requiring off-site disposal will be treated as contaminated and regulated material and will be disposed of in accordance with all local, State (including GNYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e. clean soil removed from the area above the cap), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.
- B. Material that does not meet Track 1 unrestricted SCOs (see 6 NYCRR Part 375) is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).
- C. The following documentation will be provided by the CONTRACTOR for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a letter from the CONTRACTOR to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation site in New York State. The letter will provide the project identity and the name and phone number of the CONTRACTOR. The letter will include as an attachment a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material.
- D. Non-hazardous contaminated soils (if any) taken off-Site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2.
- E. Contaminated soils (if any) from the Site are prohibited from being disposed at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).
- F. Soils that are contaminated but non-hazardous (if any) and are being removed from the Site are considered by the Division of Solid & Hazardous Materials (DSHM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without

3.5 WASTE DISPOSAL

- A. The CONTRACTOR shall temporarily cap the riser pipe of the vertical extraction well to prevent direct venting of LFG through the riser pipe. The temporary cap shall be removed during the installation of the wellheads.

3.4 TEMPORARY CAP

- D. The ENGINEER shall inspect the extraction well borings 4 to 8 weeks after completion of the final well. Excessive settlement (6" or more below surrounding grade) in the boring shall be repaired by the CONTRACTOR by adding compacted fill around the well casing at no additional cost to the OWNER.

END OF SECTION

- permit modifications only upon prior notification of NYSDEC Region 2 DSHM. This material is prohibited from being sent or redirected to a Part 360-16 Registration Facility. In this case, as dictated by DSHM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DSR remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.
- G. Documentation associated with disposal of all material must include records and approvals for receipt of the material. Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils.
- H. Hazardous wastes derived from on-Site will be handled and disposed on-Site (i.e., beneath the Landfill Cover System), whenever possible. If it is impossible to dispose of the hazardous waste on-Site, then the waste will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations.
- I. Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.
- J. Waste characterization will be performed for off-Site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported by the CONTRACTOR. All data available for soil/material to be disposed of at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.
- K. The CONTRACTOR shall not dispose of construction waste, including well cuttings, unless approved by the ENGINEER and the DEP. The CONTRACTOR shall remove spoils daily and shall be responsible for controlling odors from the spoils.
- 3.6 WELLHEAD INSTALLATION
- A. Wellhead assembly shall be installed on the vertical well in accordance with the manufacturer's recommendations. Care shall be taken not to damage the impact pilot tube during installation. If a pilot tube is damaged during installation, CONTRACTOR shall replace it at no cost to the OWNER.
- B. The wellhead shall be connected to the lateral via flexible hose, as shown on the PLANS.

A.	ASTM D-5261	Standard Test Method for Measuring Mass Per Unit Area of Geotextiles
B.	ASTM D-3776	Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
C.	ASTM D-4491	Standard Test Method for Water Permeability of Geotextiles by the Permittivity Method
D.	ASTM D-4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
E.	ASTM D-4632	Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)

1.03 REFERENCES

A.	Section 01025	MEASUREMENT AND PAYMENT
B.	Section 01300	SUBMITTALS
C.	Section 02200	EARTHWORK
D.	Section 02712	GEOCOMPOSITES

1.02 RELATED WORK

- A. The CONTRACTOR shall furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for the manufacture, storage, delivery, installation, and testing of the geotextile portions of this project, including installation as herein specified and as shown on the Drawings.
- B. The CONTRACTOR shall perform the replacement of the geotextiles removed during well drilling in the excavated area in conjunction with all necessary construction geocomposites, protective cover soil, and other components of the liner system.

1.01 DESCRIPTION

PART 1 - GENERAL

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GEOTEXTILE

F.	ASTM D-4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile.
G.	ASTM D-4833	Standard Test Method for Index Puncture Resistance of Geotextiles and Geomembranes

1.04 QUALITY ASSURANCE

- A. All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications, and shall be subjected to strict quality control monitoring as detailed herein. The installed geotextiles shall conform exactly to the Drawings and Specifications, except as otherwise authorized in writing by the ENGINEER.
- B. The CONTRACTOR shall comprehend and anticipate the CQA activities and account for these activities in the installation schedule.

1.05 SUBMITTALS

- A. Prior to shipment of any geotextile materials, the CONTRACTOR shall submit the following information on the geotextile production to the ENGINEER:

1. Roll numbers and identification numbers.
2. Quality control certificates that provide reference to the roll numbers and identification numbers, sampling procedures, test methods and test results and other items such as:
 - a. Name of Manufacturer
 - b. Chemical Composition
 - c. Product Identification
 - d. Statement of Compliance
 - e. Signature of Authorization
3. All certificates shall be signed by a representative of the manufacturer.

Test	Procedure
Flow Rate	ASTM D-4491

Permittivity	ASTM D-4491
Fabric Weight	ASTM D-5261 or D-3776
Trapezoidal Tear Strength	ASTM D-4533
Grab Elongation	ASTM D-4632
Apparent Opening Size	ASTM D-4751
Puncture Strength	ASTM D-4833

4. Unless otherwise specified, the quality control tests shall be conducted at the frequency of one per lot. One lot is defined as a group of consecutively numbered rolls or panels from the same manufacturing line.

5. The geotextile manufacturer shall replace any rolls that are rejected because they do not comply with these specifications.

6. If a sample fails to meet the quality control requirements, the manufacturer shall test each roll manufactured from the same resin batch or at the same time as the failing roll. Testing shall be at the manufacturer's expense and shall continue until a pattern of acceptable test results is established.

- C. Upon delivery to the site, the CONTRACTOR and the ENGINEER shall inspect the physical condition of each roll of material. If the protective wrapping is damaged, or if damage to the roll is suspected by the ENGINEER, the roll shall be separated from the lot for more detailed inspections.

PART 2 - PRODUCTS

2.01 GEOTEXTILE MATERIAL

A. General Requirements

1. Unless otherwise noted on the Drawings, geotextiles suppliers shall furnish materials whose "Minimum Average Roll Values", as defined by the Federal Highway Administration (FHWA), meet or exceed the criteria specified in Table 02711-1. The geotextiles provided by the supplier shall meet or exceed the property value specified and shall be stock products; i.e., unless authorized, the supplier shall not furnish products specially manufactured to meet the specifications of this project.

2. The supplier shall furnish test results for the design criteria, as well as written certification that the materials meet the specifications in accordance with Section 01300 - SUBMITTALS.

3. The geotextile material shall also perform the following:

a. Retain its structure during handling, placement and long-term service;

b. The material shall be capable of withstanding direct exposure to sunlight for 30 days with no measurable deterioration; and,

c. The material shall be chemically compatible with leachate from a typical solid waste landfill facility.

B.

Labeling

1. The geotextile shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.

2. The geotextile and rolls shall be marked or tagged with the following information:

a. Manufacturer's name;

b. Product identification;

c. Lot number;

d. Roll number; and,

e. Roll dimensions.

3. Additionally, if any special placement is required, it shall be so marked on the geocomposite material; e.g., "This Side Up", or "This Side Against Soil to be Retained".

2.02 TRANSPORTATION, HANDLING, AND STORAGE

A. Transportation of the CONTRACTOR-supplied geotextile materials is the responsibility of the CONTRACTOR. The CONTRACTOR shall be liable for all damages to the materials incurred prior to and during transportation to the site.

B. Handling, storage, and care of the CONTRACTOR-supplied geotextile materials prior to and following installation at the site is the responsibility of the

CONTRACTOR. The OWNER shall provide adequate storage space at the site. The CONTRACTOR shall be liable for all damage to the materials incurred during transportation, storage and installation, and prior to final acceptance of the liner system by the OWNER.

- C. During shipment and storage, geotextiles shall be protected from ultraviolet light exposure, precipitation, or other inundation, mud, dirt, dust, punctures, cutting or any other damaging or deleterious conditions. Any additional storage procedures required by the geotextile manufacturer shall be the CONTRACTOR's responsibility.

PART 3 - EXECUTION

3.01 HANDLING AND PLACEMENT

- A. The CONTRACTOR shall handle all geotextiles in such a manner as to ensure that they are not damaged in any way.
- B. In the presence of wind, all geotextiles shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with earth cover materials.

- C. Inspection:

1. Prior to implementing any of the Work in this Section, the CONTRACTOR shall carefully inspect the installed Work of all other Sections and verify that all Work is complete to the point where the Work of this Section may properly commence without adverse impact.

2. If the CONTRACTOR has any concerns regarding the installed work of other Sections, the CONTRACTOR shall notify the ENGINEER in writing prior to the start of the Work of this Section. Failure to inform the ENGINEER in writing will be construed as the CONTRACTOR's acceptance of the related Work of all other Sections.

- B. During placement, care shall be taken not to entrap in the geotextile stones, excessive dust, or moisture that could damage the synthetic membrane, generate clogging of drains or filters, or hamper subsequent seaming.

- C. An examination of the geotextile over the entire surface, after installation, shall be conducted to ensure that no potentially harmful foreign objects, such as needles, are

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present. Any foreign objects so encountered shall be removed by the CONTRACTOR or the geotextile shall be replaced.

D. The geotextile shall only be cut using a geotextile cutter or other methods approved by the ENGINEER.

E. After unwrapping the geotextile from its opaque wrapping, the geotextile shall not be left exposed for longer than 14 days, unless approved by the ENGINEER.

3.02 SEAMS AND OVERLAPS

A. All geotextiles shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped 6 inches prior to seaming.

B. Horizontal butt seams shall not be permitted on side slopes of 10 percent or greater.

C. The CONTRACTOR shall pay particular attention at seams to ensure that no earth cover material is inadvertently inserted beneath a geotextile.

D. Any sewing shall be done using polymeric thread with chemical and ultraviolet light resistance properties equal to or exceeding those of the geotextile. The color of the thread should contrast the color of the geotextile. The seams shall be sewn with a "flat", "J", or "butterfly" seam using a two-thread chain stitch (stitch type 401) and a double row stitch (Federal Standard Type SSA-2).

E. Seams shall be sewn a minimum of one (1) inch from the edge and shall have an average stitch count of 3 to 7 stitches per inch, or as approved by the ENGINEER.

F. The Geosynthetic Materials Installer shall maintain at least one spare operable seaming apparatus on site.

3.03 REPAIR

A. Any holes or tears in the geotextile shall be repaired by one of the following methods:

1. Listering a patch made from the same geotextile over the affected area, with a minimum of 1 foot overlap in all directions.

2. Sewing a patch made from the same geotextile over the affected area with a minimum of 6 inch overlap in all directions.

3.04 PLACEMENT OF SOIL MATERIALS

- A. The CONTRACTOR shall place all soil materials located on top of the geotextile in such a manner as to ensure:
 1. No damage of the geotextile or underlying layers;
 2. Minimal slippage between the geotextile and the underlying layers; and,
 3. No excess tensile stresses in the geotextile.
- B. Equipment shall not be driven directly on the geotextile. Unless otherwise specified by the ENGINEER, all operational equipment assessing areas where geotextile is placed shall adhere to the following soil thicknesses:

Maximum Allowable Equipment Ground Pressure (psi)	Soil Thickness Above Geosynthetics (feet)
<5	1.0
<10	1.5
<20	2.0
≥20	3.0

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Table 02711-1

REQUIRED PROPERTY VALUES FOR GEOTEXTILES

PROPERTIES	QUALIFIER	SPECIFIED VALUE	TEST METHOD
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Polymer Composition	minimum	95% weight polypropylene or polyester	ASTM D-4491
Flow Rate	minimum	75 gpm/sq.ft.	ASTM D-4491
Permittivity	minimum	0.9/sec.-1	ASTM D-4491
Trapezoidal Tear Strength	minimum	85 lbs.	ASTM D-4533
Grab Elongation	minimum	50%	ASTM D-4632
Fabric Weight	minimum	10 oz/sq. yd	ASTM D-5261 or D-3776
Apparent Opening Size (A.O.S.)	----	Sieve Size: 100 to 70	ASTM D-4751
Puncture Resistance	minimum	125 lbs	ASTM D-4833

END OF SECTION

PART I - GENERAL

1.01 DESCRIPTION

- A. The CONTRACTOR shall furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for the manufacture, storage, delivery, and testing of the geocomposite drainage cover for the system as herein specified and as shown on the Drawings.
- B. The CONTRACTOR shall perform the replacement of the geocomposite removed during extraction well drilling in the excavated area in conjunction with construction of the re-compacted clay liner, synthetic membrane, protective cover soil, and other components of the liner system.

1.02 RELATED WORK

- A. Section 01025 MEASUREMENT AND PAYMENT
- B. Section 02200 EARTHWORK
- C. Section 02711 GEOTEXTILES

1.03 REFERENCES

- A. ASTM D-1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
- B. ASTM D-751 Standard Test Method for Coated Fabrics (Section 6).
- C. ASTM D-1777 Standard Test Method for Thickness of Textile Materials.
- D. ASTM D-792 Standard Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement.
- E. ASTM D-1004 Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

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F.	ASTM D-1204	Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
G.	ASTM D-1505	Standard Test Method for Density of Plastics by Density-Gradient Technique.
H.	ASTM D-1603	Standard Test Method for Carbon Black in Olefin Plastics.
I.	ASTM D-1693	Standard Test Method for Environmental Stress Cracking of Ethylene Plastics.
J.	ASTM D-5596	Recommended Practice for Microscopical Examination of Pigment Dispersion in Geosynthetics
K.	ASTM D-3083	Standard Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining.
L.	ASTM D-4716	Standard Test Method for Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products.
M.	ASTM D-5261	Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
N.	ASTM D-3776	Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
O.	ASTM D-4491	Standard Test Method for Water Permeability of Geotextiles by the Permittivity Method.
P.	ASTM D-4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
Q.	ASTM D-4632	Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).

R.	ASTM D-4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile.
S.	ASTM D-4833	Standard Test Method for Index Puncture Resistance of Geotextiles and Geomembranes.
T.	ASTM D-413	Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials.

1.04 QUALIFICATIONS

- A. The Geosynthetic Materials Installer shall be trained and qualified to install a geocomposite drainage system. The installer shall be approved and/or licensed by the manufacturer or the fabricator of the material. A copy of the approval letter or license shall be submitted by the installer to the ENGINEER. Prior to confirmation of any contractual agreement with the construction contractor, the Geosynthetic Materials Installer shall provide the ENGINEER with the following written information:

1. Equipment and personnel to be utilized.
2. Daily anticipated installation rate.
3. Quality control manual for installation.
4. Samples of seams and certified test results.

- B. The personnel to perform the seaming operations under the supervision of the Geosynthetic Materials Inspector shall be qualified by experience. The field crew foreman must have documented experience of successfully installing at least 50 acres of landfill or comparable geosynthetic systems on a total of at least five different projects. He/she shall also have experience seaming geocomposites using the same method of seaming that will be used for this specific project. The field crew foreman shall provide direct supervision over less experienced seamers; no field seaming shall be performed without the foreman being present.

1.05 QUALITY ASSURANCE

- A. All materials, procedures, operations, and methods shall be in strict conformance with the Drawings and Specifications, and shall be subjected to strict quality control monitoring as detailed herein. The installed geocomposite drainage system shall