APPENDIX E

CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PLAN

CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PLAN

DUNN MINE AND C&D FACILITY

Prepared For:

S.A. DUNN & COMPANY, LLC
209 PARTITION STREET EXTENSION
RENSSELAER, NEW YORK 12144

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1.0 INTRODUCTION

1.1 OBJECTIVE

This Construction Quality Assurance/Construction Quality Control (CQA/CQC) Plan has been prepared in accordance with the requirements of 6 NYCRR Part 363-4.5. The objective of the Plan is to address the observations and tests that will be used before, during, and upon completion of construction of the Dunn Construction and Demolition Debris (C&D) Facility to ensure that the construction materials will meet the design criteria and specifications, and construction and certification requirements set forth in Part 363-6 and also to provide procedures for post-construction care requirements prior to initial operation. The plan should serve as the guideline for assessment of the adequacy of soil and geosynthetic materials, installation procedures, and maintenance of detailed records of the constructed project.

Amendments and clarifications to this Plan may be made by the Certifying Engineer prior to or during construction to account for field conditions and other necessary construction adjustments. These amendments and clarifications shall comply with New York State Department of Environmental Conservation (Department) regulations.

1.2 RELATED DOCUMENTS

This CQA Manual is part of a construction documents submittal to the Department for landfill construction. The Construction documents for the landfill also include the following:

- Bid form;
- General Specifications;
- Technical Specifications, and;
- Construction Drawings.

2.0 RESPONSIBILITIES AND AUTHORITIES

2.1 CQA/CQC ORGANIZATION

The following defines the authorities and responsibilities, as well as the qualifications, of the personnel involved with the implementation of the procedures outlined in this document and their respective duties during the construction project.

2.1.1 Owner

The Owner is the individual or designated representative of the firm, agency or municipality that owns and/or operates the Landfill. The Owner of this project is S.A. Dunn & Company, LLC. The Owner will retain a Contractor who will be responsible for the installation of the landfill baseliner system. There may be separate contractors for installation of certain specific components of the baseliner (e.g., earthwork and geosynthetics).

2.1.2 Certifying Engineer

The Certifying Engineer is a licensed Professional Engineer in the state of New York, with a minimum of seven years of experience in the design, construction, and testing of landfill systems. The Certifying Engineer is responsible for the oversight of the engineering team and will review and sign the permit and construction documents and drawings, as well as the construction certification report. During construction, the Certifying Engineer will provide interpretation of the approved design. This includes providing technical oversight of the CQA Officer, interpreting field and laboratory testing data, verifying construction activities are in accordance with approved design drawings, and making final determinations of the acceptability of installed work. The Certifying Engineer will act independently, and without influence from the Contractors or the Owner.

2.1.3 Engineer

The term Engineer, as used throughout this document, shall mean the Certifying Engineer or his/her designated representative.

2.1.4 CQA Officer

The Certifying Engineer will maintain full time observation staff at the site, which will be led by the CQA Officer. The number of staff present will vary as required to provide adequate coverage to document and observe the daily construction activities. The CQA Officer must have experience in landfill baseliner and final cover system construction projects, which may be educational experience or field experience, or have other construction experience acceptable to the Engineer. The CQA Officer will be on-site full time during construction and will serve as the daily contact person with the Owner and Contractors. The CQA Officer is responsible for observing daily activities of the Contractors, maintaining field records, making judgments in conjunction with the Certifying Engineer on the acceptability of installed materials, maintaining construction summary reports as detailed in Section 4.0, maintaining routine communications with the Certifying Engineer and assisting in the preparation of the final certification report. The CQA Officer will oversee the CQA observation staff.

2.1.5 CQA Observation Staff

This staff will observe and provide oversight to the Contractor's QC personnel and will report directly to the CQA Officer.

2.2 CONTRACTORS QUALITY CONTROL

Prior to the initiation of construction, the geosynthetic contractor will furnish the Contractor Quality Control (CQC) Plan, for approval by the Certifying Engineer. The plan will identify personnel, procedures, instructions, records and forms to be used. No construction will begin prior to Certifying Engineer's approval of the CQC Plan. The Contractors CQC Plan will include the following:

- Description of the quality control organization, including a chart showing lines of authority and acknowledgement that the CQC staff will be in addition to, and separate from, the contractor's project supervisory staff and will report to the Contractor's management at a level of Vice President or above in the Contractor's organization.
- The name, qualifications, duties, responsibilities, and authorities of each firm or person assigned a QC function.
- Procedures for scheduling and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents.

- Control testing procedures for each specific test included in a Quality Assurance Plan or equivalent from the proposed laboratory. Laboratory testing facilities will be approved by the Certifying Engineer.
- Reporting procedures including proposed reporting formats.

2.2.1 Geosynthetic Contractor's CQC Manager

The Contractor(s) shall provide a CQC manager who will be responsible for overall management of the CQC and have the authority to act in all CQC matters for the Contractor. This person will demonstrate the ability to perform correctly the duties required to the satisfaction of the Certifying Engineer. The CQC manager, or a designated representative, shall be present at the project site whenever work is in progress. The CQC manager shall have documented qualification of having been responsible for geosynthetic CQC on a minimum of five separate landfill (or other comparable geosynthetic projects) totaling 50 acres.

2.3 CONTRACTOR'S PERSONNEL QUALIFICATIONS

2.3.1 Geosynthetics Contractor

The geosynthetic installer must document a minimum of five projects involving 50 acres of successfully installed HDPE geomembrane within the last three years. The installer will be approved by the geosynthetic manufacturer.

Installation will be performed under the direction of a project superintendent who will have the following responsibilities and qualifications:

- The Project Superintendent will be on-site and in responsible charge throughout the liner installation, including subgrade acceptance, liner layout, seaming, testing and repairs, and all other activities contracted with the installer.
- The Project Superintendent will have the documented qualification of having supervised the installation of at least 50 acres of previous landfill, or comparable geosynthetic systems on a minimum of five different projects.
- The Project Superintendent or designated seamer will have a minimum of 25 acres of HDPE geomembrane seaming experience using the same type of seaming apparatus as that specified for this project.

- Each welding machine must be operated by a welding technician who has been certified to operate the welder by a certification program acceptable to the New York State Department of Environmental Conservation.

2.3.2 Earthworks Contractor

Work performed on other parts of the liner system will be performed by experienced, qualified installers. The contractor must have a minimum of five years of experience in the installation of landfill liner systems and have completed at least three successfully completed landfill construction projects.

3.0 CONSTRUCTION QUALITY ASSURANCE/ QUALITY CONTROL

3.1 GENERAL CQC/CQA DUTIES

Once installation begins, it is the CQA Officer's responsibility to observe and document construction of the landfill baseliner system.

The CQA Officer is responsible for observing the installation of the following components:

- Subgrade Installation and Preparation;
- Low-Permeability Soil Layer;
- Geomembrane Liner;
- Geotextile Layer, and;
- Drainage Layer.

The CQA Officer is not responsible for the supervision, direction, or control of the Contractors, nor do they have authority over or responsibility for the contractor's means, methods, techniques, sequences or procedures of construction, for the safety precautions and programs related to the contractor's work, or for the failure of the contractor to comply with laws and regulations applicable to the work.

3.2 SAMPLING

Sampling and laboratory confirmatory testing requirements for each component of the landfill construction are specified in subsequent sections and in the Technical Specifications. The CQA Officer or Designated Third Party Representative will perform the pre-construction tests specified or required in order to verify that control measures are adequate, and to provide a product that conforms to contract requirements. The CQA Officer or Designated Third Party Representative will perform the construction tests specified to ensure that the materials utilized during the construction conform to the technical specifications. The CQA Officer will procure the services of an industry- recognized testing laboratory, or an approved testing laboratory may be established at the project site. This laboratory will be approved by the Certifying Engineer. A list and schedule of tests (other than chemical sampling and analysis), which the Earthwork and Geosynthetic Contractors understand are to be performed, will be furnished as a part of the CQC plan to the Engineer. The list will give the test name, specification paragraph containing the test requirements, and the personnel and laboratory responsible for each type of test. The Earthwork and Geosynthetic Contractor will perform the following activities, and record and provide the following data:

1. Verify that testing procedures comply with contract requirements.
2. Verify that facilities and testing equipment are available and comply with testing standards.
3. Verify that recording forms, including all of the test documentation requirements, have been prepared.

3.2.1 Testing Requirements

Quality control tests or certification will be performed on, but not necessarily limited to, the following:

1. Laboratory and field testing of soils for subgrade, low permeability soil, drainage layer, and backfill.
2. Laboratory and field testing of geosynthetics materials and installation.

3.2.1.1 Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the CQA Officer or Designated Representative.

3.2.2 Non-Compliance

The Engineer will notify the Earthwork and Geosynthetic Contractor of any noncompliance with the requirements of this Plan and the Technical Specifications. The Earthwork and Geosynthetic Contractor will, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Earthwork and Geosynthetic Contractor or his representative at the site of the work, will be sufficient for the purpose of notification. If the Earthwork and Geosynthetic Contractor fails, or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop work orders will be made the subject of a claim for extension to time, or for excess costs or damages by the Earthwork and Geosynthetic Contractor.

3.3 SUBGRADE PREPARATION

Observation requirements for the CQA Officer during the Subgrade Preparation phase include the following:

- Placement of subgrade soils to reach design elevations
- Compaction of subgrade

The CQA Officer does not need to be present during excavation required to achieve design grades.

3.4 SUBGRADE LAYER

3.4.1 Observation Requirements

The CQA Officer is responsible for viewing the subgrade to confirm that the subgrade layer is ready for the placement of the low-permeability soil layer. At a minimum, the CQA Officer will:

- Confirm the suitability of the subgrade soil.
- Confirm that, where applicable, the soil is installed in compacted lifts which are a maximum of eight inches in thickness.
- View the subgrade area to check for the presence of sharp rocks, construction utensils, debris, survey stakes, organic matter, vegetation, clumps of soil and any other unsuitable objects.
- View the subgrade layer is property compacted, smooth, and uniform.
- Confirm the subgrade is substantially free of surface depressions, fissures, irregularities and abrupt breaks in slopes.
- Review a record drawing of the subgrade layer prepared by the Earthwork Contractor's registered land surveyor.

Each of these activities must be observed and carefully documented by the CQA Officer. Soils shall conform to Technical Specification Section 02210.

3.4.2 Pre-Construction Testing Requirements

A sample of the subgrade soil shall be collected by the CQA Officer from each borrow source used by the Earthworks Contractor and delivered to a qualified independent geotechnical testing laboratory for analysis. The sample shall be sent to a qualified independent geotechnical testing laboratory for analysis of those tests specified in Table 1 provided below. The CQA Officer will review all test results with the Certifying Engineer.

Table 1. Subgrade Pre-Construction Testing			
Material	**Test**	**Standard**	**Min. Test Frequency**
Subgrade	Grain Size	ASTM D422	1 Test/Source
	Modified Proctor	ASTM D1557	1 Test/Source
	Direct Shear	ASTM D3080	1 Test/ Source
Note: Direct shear testing and interface shear testing (subgrade/low permeability soil) shall be completed before construction commences. Refer to Section 3.6.8 Conformance/Acceptance Testing for testing conditions.			

3.4.3 Construction Testing Requirements

As part of the required construction testing, the CQA Officer or a licensed subcontractor will conduct field density tests using a nuclear density gauge. Testing frequencies shall be as shown in the Table 2 below. The nuclear density gauge will be checked daily by performing a standard count to ensure it is functioning properly.

Table 2. Subgrade Construction Testing			
Material	**Test**	**Standard**	**Min. Test Frequency**
Subgrade	Field Density/Moisture Content Tests	ASTM D2922/D3017	9 tests/acre; 1 test/100 LF berm

3.5 LOW-PERMEABILITY SOIL LAYER

3.5.1 Observation Requirements

The placement of low-permeability soil layer must be carefully monitored to verify conformance with the specified degree of compaction, layer thickness, and maximum saturated hydraulic conductivity. These characteristics are used to assess the layer's ability to impede the flow of liquids through the layer.

The CQA Officer is responsible for viewing the installed low-permeability soil layer to confirm that the low-permeability soil layer is ready for the placement of the geomembrane liner. At a minimum, the CQA Officer should:

- View incoming material loads to visually assess moisture and other characteristics.
- Observe the material as it is being installed to confirm that:
  - the material remains uniform and relatively consistent in gradation;
  - the soil is installed in approximate 8-inch thick compacted lifts (minimum thickness at each location shall be 24 inches);
  - the low-permeability soil layer is at least 24 inches thick;
  - clod sizes are minimized to the extent possible;
  - the material is installed at the appropriate moisture conditions;
  - the soil is protected prior to and after compaction to limit desiccation;
  - enough passes are made by the compaction equipment to achieve suitable compaction, and;
  - bonding between lifts is maximized by "tracking" each lift prior to the installation of successive lifts.
- Observe and verify in-situ density and moisture content tests.
- Review a record drawing of the low-permeability soil layer prepared by the Earthwork Contractor's registered land surveyor; final slopes must be no less than 2 percent nor more than 33 percent.

Each of these activities must be observed and carefully documented by the CQA Officer. Soils shall conform to the Technical Specifications Section as provided in Section 5 of this Plan.

The CQA Officer may also excavate test pits where more than one lift of material is provided to evaluate the bonding between successive lifts. Those areas exhibiting distinct layering or inadequate bonding between lifts must be reworked.

Perforations in the low-permeability soil layer that results from nuclear density test probe locations, sample tubes locations or test pit locations shall be backfilled and compacted by hand with bentonite or low permeability soil obtained from an on-site stockpile.

3.5.2 Pre-Construction Testing Requirements

A sample of the low-permeability soil shall be collected from each borrow source used by the CQA Officer or Designated Representative and delivered to a qualified independent geotechnical testing laboratory for analysis. The sample shall be sent to a qualified independent geotechnical testing laboratory for analysis of those tests specified in Table 3 provided below. The CQA Officer will review all test results with the Certifying Engineer.

Table 3. Low Permeability Soil Layer Pre-Construction Testing			
Material	**Test**	**Standard**	**Min. Test Frequency**
Low Permeability Soil	Grain Size/Hydrometer	ASTM D422	1 Test/Source
	Moisture Content	ASTM D2216	1 Test/Source
	Atterberg Limits	ASTM D4318	1 Test/ Source
	Modified Proctor	ASTM D1557	1 Test/Source
	Permeability	ASTM D5084	1 Test/Source
	Direct Shear	ASTM D3080	1 Test/Source
	Interface Shear	ASTM D5321	1 Test/Source

3.5.3 Construction Testing Requirements

3.5.3.1 Conformance Testing Requirements

Samples of the low-permeability soil shall be collected, during placement, at minimum testing frequencies as shown in Table 4 below. The CQA Officer shall send the samples to a qualified independent geotechnical testing laboratory for analysis. The laboratory test results must be made available in a timely manner so as to allow the Certifying Engineer and/or CQA Officer time to notify the Earthworks Contractor of any deficiencies. The CQA Officer will review all test results with the Certifying Engineer.

Table 4. Low Permeability Soil Layer Construction Testing			
Material	**Test**	**Standard**	**Min. Test Frequency**
Low Permeability Soil	Grain Size/Hydrometer	ASTM D422	1 Test/2,500 CY
	Moisture Content	ASTM D2216	1 Test/1,000 CY
	Atterberg Limits	ASTM D4318	1 Test/ 1,000 CY
	Permeability	ASTM D5084	1 Test/5,000 CY
	Moisture-Density-Permeability	ASTM D1557 and ASTM D5084 (see note below)	1 Test/5,000 CY

Note: The testing lab will perform the following testing in order to provide sufficient information for the Engineer to develop a moisture-density-permeability relationship as described in the Technical Specifications.

3.5.3.2 In-Place Soil Testing

Samples of the in-place soil shall be collected via Shelby tubes at minimum testing frequencies as shown in the table below. The samples shall be sent to a qualified independent geotechnical testing laboratory for analysis by the CQA Officer. The laboratory test results must be made available in a timely manner so as to allow the Certifying Engineer and/or CQA Officer time to notify the Earthwork Contractor of any deficiencies. The CQA Officer will review all test results with the Certifying Engineer.

Use of the nuclear density method is the preferred method for field density and moisture content testing due to the ease of testing and relatively large number of tests which can be performed in a short period of time. The CQA Officer or a licensed subcontractor will be responsible for conducting field density tests. Testing frequency shall be, at a minimum, nine compaction tests per lift per acre. The nuclear density gauge will be checked daily by performing a standard count to ensure it is functioning properly.

At locations where the field-testing indicates densities below the requirements of the specification, these areas shall be reworked by the Earthwork Contractor and re-tested. Table 5 below details the types of tests and minimum testing frequencies required for the low-permeability soil during the construction process.

Table 5. Low Permeability Soil In-Place Testing

Material	Test	Standard	Min. Test Frequency
Low Permeability Soil	Permeability	ASTM D5084	1 Test/Acre/Lift
	Field Density/Moisture Content	ASTM D2922/C3017	9 Tests/Acre/Lift

3.6 GEOMEMBRANE LINERS

3.6.1 Observation Requirements

The geomembrane shall be a 60-mil textured high density polyethylene (HDPE) liner. The installation of the geomembrane liners will include the following related activities:

- Delivery of geomembrane materials to the project site,
- Final observations of the low permeability soil layer before placement of the geomembrane,
- Delivery of geomembrane materials to the work area from the on-site storage area,
- Deployment and positioning of geomembrane panels,
- Geomembrane seaming and testing of seams, and
- Anchoring of geomembrane panels in an anchor trench.

Each of these activities must be observed and carefully documented by the CQA Officer. Documentation will include a summary table of geomembrane installation indicating the total number of seaming crew, number of machines used (fusion and extrusion) and the number of trial welds performed. Geomembrane liner shall conform to the Technical Specifications Section 02500.

In addition to observation and documentation of geomembrane deployment, testing must be performed on samples of geomembrane to verify its conformance with project specifications. Testing must also be performed on seams constructed in the field. All independent laboratory geosynthetics testing must be performed by a Geosynthetics Accreditation Institute – Laboratory Accreditation Program (GAI-LAP) certified laboratory. The CQA Officer is responsible for observing and verifying that samples are collected by the Geosynthetics Contractor for these conformance/acceptance tests as well as observing collection of seam samples for laboratory testing, observing testing of trial seams, and observing non-destructive testing of seams.

The CQA Officer will observe the texturing of the geomembrane liner to ensure consistency across the panel. The texturing of each deployed panel will be compared to an archived sample previously obtained for interface shear testing. Any panel with texturing inconsistent with the archived sample will be rejected by the CQA Officer. Additional interface shear testing may be performed on the rejected panels as directed by the CQA Officer in order to allow rejected panels to be used in the project.

3.6.2 Materials Transport and Storage

The geomembrane manufacturer and/or Geosynthetics Contractor are responsible for the safe and proper transport of all lining materials to the project site. The Geosynthetics Contractor will ensure the scheduled arrival date of the geomembrane is acceptable to the Facility Manager and the CQA Officer will verify that the storage area has been properly prepared. The geomembrane should be delivered before the final clay lift placement to avoid desiccation and the need to rework desiccated areas.

Once the geomembrane has arrived, the CQA Officer is responsible for viewing all materials for visual evidence of damage and the conditions under which the geomembrane was transported to the project site. Observations shall be documented and, if possible, should be performed in the presence of a representative of the manufacturer or Geosynthetics Contractor. The observations should include the following:

- Observe the unloading of the geomembrane at the designated on-site storage area. The storage area must be sufficiently distant from heavy equipment traffic and accessible only to authorized personnel.
- Confirm material quantities.
- Record geomembrane identification markings and viewing of each roll.
- Conduct a completeness review of geomembrane Quality Control Certificates. Each roll must be accompanied by a certificate which indicates the manufacturer's name, type of material, nominal thickness, specific gravity, melt flow index, percent carbon black, carbon black dispersion, roll width and length, resin batch code and date of manufacture.
- Conduct a completeness review of raw material Quality Control Certificates. Since different geomembrane rolls for a specific project may be manufactured from different resin batches, a certificate must be furnished for each resin batch.

All information compiled must be cross-checked with the project specifications.

In addition to viewing manufactured materials delivered to the project site, the CQA Officer is responsible for viewing the material's storage area. The CQA Officer should be thoroughly familiar with the manufacturer's storage specifications. Consideration should be given to ambient temperature, control of access, location with respect to vehicular traffic movements, and means proposed to protect the geomembrane from the elements. If the geomembrane is to be stored in contact with the ground, protective mats or sand may need to be spread on the surface to prevent damage from sharp rocks or debris.

3.6.3 Final Viewing of the Low Permeability Soil Layer

Before the geomembrane liner is deployed, a thorough viewing and verification of the underlying low permeability soil layer surface must be completed by the Certifying Engineer. In order to minimize transport and exposure of the geomembrane to the elements, the low permeability soil layer should be approved prior to allowing the Geosynthetics Contractor to begin geomembrane deployment.

3.6.4 Geomembrane Placement and Positioning

Panel placement should typically commence at the upgradient limit of work and progress in a downhill fashion. The panels can be placed by manually unrolling the geomembrane into position or by using heavy equipment. As much as practicable, the panels should be oriented parallel to the line of maximum slope, (i.e., oriented up and down, not across, the side slope). In corners and odd shaped geometric locations, the number of field seams should be minimized. Horizontal seams should not be within five feet of the toe of the slope in either direction and staggered so as not to be continuous throughout the construction.

After the geomembrane is completely unrolled it must be positioned. If the panel is being installed abutting a previously placed panel, care must be taken to align the sheets for seaming. When positioned, wrinkles should be worked out of the geomembrane prior to seaming. The Geosynthetics Contractor shall provide ballast as needed, usually sandbags, to prevent the movement of deployed geomembrane.

3.6.5 Geomembrane Seaming

Once adjoining panels are placed and aligned, seaming may commence. Typically, two welding methods will be employed to seam the HDPE: (1) the double-track hot-wedge weld, and (2) the extrusion weld. Prior to completing either type of weld, the geomembrane surface to be welded must be free of dust, silt and debris. Furthermore, the welding surface must be dry and at the proper temperature. The Geosynthetics Contractor should be equipped with an ample supply of rags to dry and clean the welding surface.

3.6.5.1 General Seaming Requirements

Regardless of the seaming procedure employed by the Geosynthetics Contractor, the following general requirements must be satisfied during the seaming of the geomembrane.

- Seaming shall only be performed under proper weather conditions. The highest and lowest allowable temperatures for welding is based on conditions such as ambient temperature, wind, subgrade conditions, exposure to sunlight, material type, and material thickness. Welding in extreme temperatures can be performed by increasing or decreasing the welding speeds and/or wedge temperature. Seaming shall not be performed when either air or sheet temperature is below 32° Fahrenheit (F) or above 120°F, when the sheet temperature exceeds 158° F, during periods of precipitation or when sustained winds are in excess of 20 miles/hour.
- Seaming shall be performed only when the geomembrane is dry and protected, and shall not be performed during periods of precipitation unless the material is protected. The CQA Officer shall determine whether or not the weather conditions are appropriate.
- Seams must extend the full length of the panels being joined. When seaming adjacent panels at an anchor trench, the seam shall extend completely through the anchor trench.
- Wrinkles on a seam must be removed by cutting the geomembrane and installing an overlapping patch.
- Every seam, once completed, must be tested by non-destructive testing procedures to establish its continuity. Seams which do not pass such testing must be repaired and re-tested.
- Seam samples for destructive testing must be taken at a minimum of every 1,000 linear feet of seam, per machine, per day. Additional testing may be warranted when seaming conditions are not optimal due to ambient temperature or if there is reason to suspect that the seam quality is inadequate.
- The Geosynthetics Contractor is responsible for the collection of seam samples and providing samples for field testing and archive. Duplicate samples shall be provided to the CQA Officer to send to independent laboratory for testing.

3.6.5.2 Hot-Wedge Weld

The hot-wedge weld is accomplished using a special device to heat adjoining geomembrane panels. The welding device is equipped with a heating element, referred to as the hot-wedge, which is allowed to contact the bottom of the overlapping panel and the top of the previously placed panel. Once the adjoining panels are overlapped a minimum of approximately three inches and heated via the hot-wedge, the two surfaces are squeezed together with rollers, resulting in a bond between the adjoining panels. Since the hot-wedge welding machine is equipped with two wedges and two sets of rollers, the final bond actually consists of parallel welds with an air gap between the welds. The quality of the hot-wedge weld is dependent on the temperature of the hot-wedge and the speed at which the welding is performed. Both of these variables are controlled by the machine operator.

3.6.5.3 Extrusion Weld

Extrusion welding joins abutting geomembrane panels by creating a bond between the panels with an extruded bead of high-density polyethylene. This welding process requires additional preparation above and beyond usual cleaning of the weld surface. Specifically, the weld surface must be abraded to remove the sheen on the surface of the geomembrane to provide a surface that is more conducive to accepting a weld. Abrasion of the weld surface is normally accomplished using a disc grinder with an abrasive disc. Great care must be taken to assure that the abrasion process does not sacrifice the strength of the weld by substantially diminishing the thickness of the geomembrane.

3.6.5.4 Cold Weather Seaming

When the geomembrane sheet temperature is between temperatures 32 °F and 40°F, the following may apply to seaming operations at the discretion of the CQA Officer:

- Trial welds may be performed more frequently as the length of time a seaming crew may work will likely be reduced.
- Trial welds may be given additional scrutiny. It is particularly important, in cold weather, to make sure trial seams are made under the same conditions as will be experienced in the work-area. Since the substrate will be cold, the trial weld must simulate this condition.
- The CQA Officer may require an increase in the frequency of destructive testing, if seam strength or seam integrity is suspect.

When the geomembrane sheet temperature is 32°F or less, approval to seam is required from the New York State Department of Environmental Conservation (NYSDEC). The Geosynthetic Contractor must prepare appropriate protocol, at a minimum following the procedures described in GRI-GM9 – "Standard Practices Cold Weather Seaming of Geomembranes" for submission and approval.

3.6.5.5 Hot Weather Seaming

Seaming in hot weather will likely be controlled by the ability of the seaming crew to work under such conditions. Also, during high temperature conditions seam "burn-outs" can occur. If an excessive number of "burn-outs" occur, seaming operations should cease. The effects of high temperatures on seaming may be counteracted by increasing the speed of seaming or decreasing the welding temperature. However, this may affect seam strength so seam quality should be checked via trial welds and/or additional destructive tests.

3.6.6 Quality Control Testing Requirements

3.6.6.1 Geomembrane Resin

The manufacturer of the geomembrane shall supply the CQA Officer with quality control certificates on each batch of resin used to produce geomembrane and welding rod for the project. The certificates shall be prepared by the resin producer and provide results of tests indicated in Table 6 below.

Table 6. Geomembrane Resin Properties and Quality Control Testing Requirements

Test	Standard	HDPE Value
Density	ASTM D1505	0.932 g/cc (min.)
Melt Flow Index	ASTM D1238	1.0 g/10 minutes (max.)

3.6.6.2 Geomembrane Rolls

The manufacturer of the geomembrane shall supply the CQA Officer with quality control certificates on each roll of geomembrane material used for the project. The certificates shall be prepared by the geomembrane manufacturer and provide results of tests indicated in Table 7 below.

Table 7. 60-Mil HDPE Geomembrane Testing Frequency and Test Methods[1]		
Test	**Frequency**	**Value**
Thickness (ASTM D5994)	Each roll	57 mil (min. avg.) 8 out of 10 values[2] = 54 mil (min.) 10 out of 10 values[3] = 51 mil (min.)
Asperity Height (ASTM D7466)	Every second roll	16 mil (min. avg.)
Density (ASTM D1505/792)	200,000 lbs.	0.940 g/cc (min. avg.)
Tensile Properties (ASTM D6693 – Type IV)	20,000 lbs.	Yield strength: 126 ppi Break Strength: 90 ppi Yield elongation: 12% Break elongation: 100%
Tear Resistance (ASTM D1004)	45,000 lbs.	42 lbs. (min. avg.)
Puncture Resistance (ASTM D4833)	45,000 lbs.	90 lbs. (min. avg.)
Stress Crack Resistance (ASTM D5397)[4]	per GRI GM10	500 hr
Carbon Black Content (ASTM D4218)	20,000 lbs.	2%-3%
Carbon Black Dispersion (ASTM D5596)	45,000 lbs.	9 values: Category 1 or 2 1 value: Category 3
Oxidative Induction Time (OIT) (e) Standard OIT (ASTM D3895) — or — (f) High Pressure OIT (ASTM D5885)	200,000 lbs.	100 (min. avg.) 400 (min. avg.)
Oven Aging at 85°C (ASTM D5721) (a) Standard OIT - % ret. after 90 days (ASTM D3895) — or — (b) High Pressure OIT - % ret. after 90 days (ASTM D5885)	per formulation	55% (min. avg.) 80% (min. avg.)

Table 7. 60-Mil HDPE Geomembrane Testing Frequency and Test Methods[1]		
Test	**Frequency**	**Value**
UV Resistance (GM11) (a) Standard OIT (ASTM D3895) — or — (b) High Pressure OIT -% ret. after 1600 hrs. (ASTM D5885)	per formulation	N.R.[5] 50% (min. avg.)

Notes: 1. Properties presented in this table are based on GRI GM13, Test Methods, Test Properties and Testing.
Frequency for HDPE Smooth and Textured Geomembranes, Revision 12, dated 11/14/2014.
2. Lowest individual for 8 out of 10 values.
3. Lowest individual for any of the 10 values.
4. See note #4 in table 2(a) of GRI GM13.
5. See note #10 in table 2(a) of GRI GM13.

The geomembrane manufacturer shall provide certification proving that the geomembrane to be utilized is approved by GRI Test Method GM13 (high-density polyethylene geomembrane) as developed by Geosynthetic Research Institute.

3.6.7 Quality Assurance Testing Requirements

3.6.7.1 Geomembrane Delivered to Project

The Geosynthetics Contractor is responsible for taking, and the CQA Officer is responsible for observing and verifying, one sample per 100,000 square feet of material delivered to the site. The samples should be a minimum of three (3) feet long by the entire roll width and should not include the first five (5) feet of roll length. Each sample should be marked with the following information: the manufacturer's roll identification number, the date the sample was obtained, and the machine direction. The samples shall be sent to an independent testing laboratory for analysis of those tests specified in the table provided below.

Table 8. Geomembrane Quality Assurance Testing			
Material	**Test**	**Standard**	**Min. Test Frequency**
60-mil Textured HDPE Geomembrane	Thickness	ASTM D5994	1 Test/100,000 SF
	Density	ASTM D1505	1 Test/100,000 SF
	Asperity Height	GRI-GM 12	1 Test/100,000 SF
	Tensile Properties	ASTM D638	1 Test/100,000 SF
	Tear Resistance	ASTM D1004	1 Test/100,000 SF
	Puncture Resistance	ASTM D4833	1 Test/100,000 SF
	Carbon Black Content	ASTM D1603	1 Test/100,000 SF
	Carbon Black Dispersion	ASTM D5596	1 Test/100,000 SF

3.6.8 Interface Shear Testing Requirements

Interface shear testing will be performed on each interface of the geosynthetic base liner system in accordance with ASTM D5321. Direct shear testing will be performed on each base liner soil material in accordance with ASTM D3080. Normal stresses applied to each test will be 500 psf, 5,000 psf and 10,000 psf. The materials should be hydrated to equilibrium conditions, as appropriate, and sheared under drained conditions. The following are the interfaces with testing conditions:

- Low-permeability soil/ geomembrane – to be tested at a compaction of approximately 85% of the maximum dry density for low-permeability soil and under saturated conditions.
- Geomembrane/Geotextile

The samples of geomembrane should be a minimum of three (3) feet long by the entire roll width and should not include the first five (5) feet of roll length. A one (1) foot by the entire roll width portion of each interface sample shall be retained on site for comparison with deployed panels (see Section 3.6.1).

When testing the interface shear of any material against textured geomembrane material, the test shall be performed on the smoothest portion of the geomembrane sample as determined by an asperity height gauge.

3.6.9 Construction Testing Requirements

Testing of the geomembrane seams shall be performed in accordance with ASTM D-6392, in conjunction with GRI-GM19. All seams shall meet the requirements in Table 9 below:

Table 9. Field Seam Strength Requirements

Material	Peel Strength		Peel Separation	Shear Strength
	Extrusion Weld	Hot Wedge Weld		
60 mil textured HDPE	78 ppi	91 ppi	25%	120 ppi

3.6.9.1 Trial Seams

Trial welds shall be performed with each welding apparatus to be used as follows:

- At the beginning of each seaming period,
- At least once every four (4) hours,
- When a different operator takes over running the welding equipment, and
- When the welding equipment has been shut off or has been unused for a period for one hour or longer.

Trial welds shall be performed on fragment pieces of geomembrane, varying in length between three-feet (extrusion welds) to ten-feet (double-track welds) long and one (1) foot wide. Once completed, the weld shall be visually inspected for deficiencies before taking a minimum of seven, one-inch wide random specimens from the trial weld. Each specimen shall be tested in the field by the Geosynthetics Contractor for peel and sheer strength (five in peel, two in shear) using a field tensiometer with the results being properly recorded by the Geosynthetics Contractor and CQA Officer. When peel testing is performed, both welds of double fusion welds shall be tested to provide an indication of the quality of the weld. All trial weld specimens shall exhibit a film tear bond (FTB) and meet or exceed the minimum seam strength requirements. Only those pieces of equipment which provide passing test results shall be used for seaming or repair work.

Additional trial welds must be performed for failed samples. The welding conditions shall be altered, including adjusting the temperature of the hot-wedge (or extrusion welding gun) and/or the speed at which the weld is performed. Once adjustments have been made, additional trial welds shall be made on fragments of geomembrane, which shall be re-tested. If the specimen fails, the seaming apparatus and procedures will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful trial welds are achieved.

Trial welds shall be performed by the welder responsible for using that piece of equipment. The objective of the trial weld is to simulate field-seaming conditions. No attempt should be made to create an ideal environment for completing a trial weld.

The CQA Officer will:

- observe and document the trial welds,
- confirm trial weld samples are properly labeled (e.g., machine number, welder, temperature control setting, and test results), and
- archive trial welds for the Facility Manager.

3.6.9.2 Non-Destructive Testing

The purpose of non-destructive seam testing is to verify the continuity of a field seam, not to provide an indication of the seam's strength. All seams constructed in the field shall be subjected to non-destructive testing along their entire lengths. The CQA Officer will observe the tests, record test results, the name of the individual performing the test, and the location of the test. Areas found to be defective shall be marked as requiring repair. In general, seam testing should be done immediately following seaming operations. The Geosynthetic Contractor should not be permitted to complete all field seams prior to the commencement of testing.

Non-destructive seam tests should be completed using the Air Pressure Test or the Vacuum Box Test as outlined in this section, unless otherwise approved by the Certifying Engineer and/or CQA Officer.

Air Pressure Test

The air pressure test will be performed on all double-track hot-wedge welds. This test method involves the application of air pressure to the channel between the parallel welds for a specified period of time and observing the stability of the pressure for the duration of the test.

The usual procedure for completing an air pressure test is as follows:

- Seal both ends of the seam length to be tested.
- Insert air feed device (usually a hollow needle) into the air channel between the two parallel welds.
- Pressurize the air channel to a pressure between 27 and 30 psi and then cease airflow to the seam by closing the valve in the air feed line.
- Once pressurized, the seam should be allowed a "relaxing period" of at least 2 minutes. This period will allow the air temperature and pressure in the seam channel to stabilize.
- Record seam pressure at the end of the "relaxing period" and use the recorded pressure as the initial pressure for the seam test. If the initial pressure is below 27 psi, additional air shall be introduced into the seam channel so that a minimum pressure is used to start the test.
- Allow seam channel to stand for 5 minutes. If a pressure loss exceeding 3 psi is observed, the seam shall be considered discontinuous and repairs will have to be made.
- At the conclusion of a passing seam channel test, the end of the seam channel opposite the pressure test gauge must be cut to relieve the test pressure. If the pressure gauge does not detect the loss of pressure it must be assumed that the seam channel is blocked. In this case the location of the blockage must be identified and the seam retested in segments for continuity.

Following the seam test, the CQA Officer will verify that seam channel perforations and cuts made during the test have been properly sealed. Any defective areas shall be marked, repaired, and re-tested by the Geosynthetics Contractor using the vacuum box test method, as detailed in the next section.

Table 10. Air Pressure Testing

Material	Test	Standard	Min. Test Frequency
HDPE Geomembrane	Seam Continuity	GRI-GM6	100% Double Fusion Welds

Vacuum Box Test

The vacuum box test is typically used on seams which cannot be tested by air pressurization. This test is predominantly used on extrusion welds used for patches and repairs.

The procedure for completing a vacuum box test is as follows:

- Apply a generous amount of soapy solution to the seam length to be tested.
- Place vacuum box test apparatus over wetted portion of the seam and apply a vacuum of at least 2 psi to the seam or until the tested area has risen off the ground due to the applied vacuum.
- During the test, the response of the soapy solution on the weld should be observed and noted. Bubbling of the solution indicates the presence of a hole or discontinuity, the location of which shall be marked and repaired.
- Move the vacuum box over to adjoining areas and repeat the process.

Since the test apparatus must be moved along the length of the seam in order to perform a complete seam continuity test, the CQA Officer must confirm segments of the seam are not passed over and that each test is conducted properly.

Table 11. Vacuum Box Testing

Material	Test	Standard	Min. Test Frequency
HDPE Geomembrane	Seam Continuity	Vacuum Box Test	100% Extrusion Welds

3.6.9.3 Destructive Testing

The non-destructive seam testing procedures presented in Section 3.5.9.2 only establish seam continuity and not seam strength; they do not provide for a quantitative comparison with specified seam qualities. As a result, samples of completed seams must be collected and subjected to laboratory examination. At a minimum, one seam sample must be taken, at random, every 1,000 feet of seam welded, per seaming machine, per day. If field conditions warrant, or the CQA Officer suspects a seam may not have been constructed properly, samples may be collected at a greater frequency.

Sample Collection

One seam sample shall be collected, at random, a minimum of every 1,000 feet of seam, per seaming machine, per day. Each sample shall be cut from the seam by the Geosynthetics Contractor. The CQA Officer will:

- Specify locations for the test samples.
- Observe the collection of samples.
- Identify the sample with a number and verify it is marked accordingly.
- Note the sample location, the date, the reason for sampling (e.g., random sample, previous failure), and other pertinent information in the project log.
- Confirm that the sample location is repaired as soon as practicable following sample collection.

Sample Size

Destructive samples shall be approximately twelve (12) inches wide and fifty (50) inches long, centered over the seam. Seven 1-inch wide by 12-inch long specimens shall be cut from each sample by the Geosynthetics Contractor. Each specimen shall be tested in the field by the Geosynthetics Contractor for peel and sheer strength (five in peel, two in shear) using a field tensiometer with the results being properly recorded by the Geosynthetics Contractor and CQA Officer. When peel testing is performed, both welds of double fusion welds shall be tested to provide an indication of the quality of the weld. All specimens shall exhibit a film tear bond (FTB). The peel strength of four out of five specimens in peel shall meet or exceed the minimum seam strength requirements. The fifth specimen must meet or exceed 80% of the minimum seam strength requirements. If the sample passes the field peel and shear tests, the remaining sections shall be cut and distributed as follows:

- one 12 inch by 12 inch section for the CQA Officer to preserve for the Facility Manager's archives,
- one 12 inch by 12 inch section for the Geosynthetics Contractor, and
- one 12 inch by 18 inch section for shear and peel testing by the Geosynthetics Contractor’s independent laboratory.

Laboratory Testing

An independent testing laboratory will perform all material conformance testing and confirmation of the field destructive seam testing. Samples should be collected, packaged, and sent to the independent laboratory on the same day that the samples are obtained by the CQA Officer.

All independent laboratory testing shall be in accordance with the requirements of this specification. Conformance testing shall conform to the standards listed and destructive seam samples will be tested for peel and shear strength. For each destructive sample submitted, five (5) specimens shall be tested under each test method. When peel testing is performed, both welds of double fusion welds shall be tested to provide an indication of the quality of the weld. The peel strength of four out of five specimens in peel shall meet or exceed the minimum seam strength requirements. The fifth specimen must meet or exceed 80% of the minimum seam strength requirements.

Laboratory results shall become available in a timely manner so as to allow the Certifying Engineer or CQA Officer time to notify the Geosynthetics Contractor of any failures. No areas of the geomembrane may be covered prior to receiving test results from the independent laboratory.

Sample Failure Response

If the sample fails the peel and shear tests by the Geosynthetics Contractor's independent laboratory, then the Geosynthetics Contractor has the following options to reconstruct the seam between the failed location and any passed test section:

- cap stripping of the seam, or
- replacing the failed seam with a new two foot wide panel which is double-track welded to the adjacent panels, or
- retrace the failed seam in both directions, by taking additional samples for destructive testing and conducting field peel and shear tests, until the length of the poor quality seam is established. Additional destructive samples shall be collected at minimum intervals of ten (10) feet from the location of the failed sample. Upon attaining passing results from the destructive samples, the seam shall be reconstructed between the passing location and the original failed location.

All passing seams shall be bounded by two locations from which passing laboratory destructive tests have been taken. Reconstructed seams of over 50 feet or more in length must have a sample taken from the reconstructed seam in order to pass the destructive testing.

Table 12. Destructive Testing			
Material	**Test**	**Standard**	**Min. Test Frequency**
HDPE Geomembrane	Seam Peel[1]	ASTM D6392	1 Test/1,000 LF/seaming machine
	Seam Shear	ASTM D6392	1 Test/1,000 LF/seaming machine
1. Both welds shall be tested on samples of double-track welds.			

3.6.10 Detail and Repair Work

Once the geomembrane has been deployed, the panels must be examined for flaws, holes, defects and tears. Each location requiring a repair shall be repaired using the following procedures:

- Patching - A patch shall be used to repair defects in the geomembrane which are 1/8-inch or larger.
- Abrading and Re-welding - This procedure may be used to repair seam sections which are less than 10 feet in length.
- Spot Welding - Spot welding may be used to repair small tears, pinholes and/or other small defects.
- Capping – Capping shall be used to repair failed seams that are greater than 10 feet in length.

Patches or caps shall extend at least six inches beyond the edge of the defect. The edges of the new section of liner shall be extrusion welded to the old liner after the liners are abraded by a disc grinder with an abrasive disc in order to remove the sheen of the surface of the geomembrane and to provide a surface which is more conducive to accepting the weld. Welding of the repair patch is completed by extrusion welding the geomembrane. The repairs shall be non-destructive tested using the vacuum-box method.

3.7 SOIL DRAINAGE LAYER

The drainage layer is comprised of a permeable drainage layer and an interconnected network of perforated leachate collection pipes enveloped in stone.

3.7.1 Leachate Collection Pipes and Stone

3.7.1.1 Observation Requirements

The leachate collection pipes are used to convey leachate from the surface of the geomembrane liner into the leachate management system. The position of the leachate pipes are to be in accordance with locations specified on the design drawings and adjusted to field conditions, so as to provide the most effective drainage capability. During installation of leachate collection pipes, the CQA Officer will:

- view incoming loads of the leachate collection pipe and stone; and
- observe the placement of the leachate collection pipes on the surface of the underlying layer.

3.7.1.2 Pre-construction Testing

The CQA Officer or Designated Representative is responsible for taking one sample of the leachate collection stone from each source used. These samples must be sent to a qualified independent geotechnical testing laboratory for analysis of those tests specified in Table 13 provided below. The test results will be reviewed by the Certifying Engineer and the CQA Officer.

Table 13. Leachate Collection Stone Pre-Construction Testing

Material	Test	Standard	Min. Test Frequency
Leachate Collection Stone	Grain Size	ASTM D422	1 Test/Each Source
	Carbonate Content	ASTM D3042	1 Test/Each Source

Note: Carbonate content should be performed using a solution with a pH representative of landfill leachate.

3.7.2 Drainage Layer Materials

3.7.2.1 Observation Requirements

The drainage layer materials are used to protect the geomembrane liner and convey leachate from the geomembrane surface to the leachate collection pipes. During installation of the drainage layer, the CQA Officer will:

- View incoming loads of the drainage layer material,
- Observe and record the placement of the drainage layer on the surface of the geomembrane liner, and
- Collect samples of the drainage layer for specified compliance testing.

Each of these activities must be observed and carefully documented by the CQA Officer. Soils shall conform to the Technical Specifications Section 02550.

3.7.2.2 Pre-Construction Testing Requirements

The CQA Officer or Designated Representative is responsible for taking one sample of the drainage material from each source used. These samples must be sent to a qualified independent geotechnical testing laboratory for analysis of those tests specified in Table 14 provided below. The test results will be reviewed by the Certifying Engineer and the CQA Officer.

Table 14. Drainage Layer Pre-Construction Testing

Material	Test	Standard	Min. Test Frequency
Drainage Layer	Grain Size	ASTM D422	1 Test/Each Source
	Permeability	ASTM D2434	1 Test/Each Source
	Carbonate Content	ASTM D4373	1 Test/Each Source
	Direct Shear	ASTM D3080	1 Test/Each Source

Note:

- *Carbonate content should be performed using a solution with a pH representative of landfill leachate.*
- *Direct shear testing and interface shear testing (geotextile/drainage layer material) shall be completed before construction commences.*

3.7.2.3 Construction Testing Requirements

The Certifying Engineer and the CQA Officer must confirm that the necessary grain size and hydraulic conductivity tests have been performed. One sample of the drainage layer material shall be collected at the frequencies shown below (see Table 15 below) and sent to a qualified independent geotechnical laboratory by the CQA Officer. The laboratory results must become available in a timely manner so as to allow the Certifying Engineer or CQA Officer time to notify the Earthworks Contractor of any deficiencies.

Table 15. Drainage Layer Construction Testing

Material	Test	Standard	Min. Test Frequency
Drainage Layer	Grain Size	ASTM D422	1 Test/1,000 CY
	Permeability	ASTM D2434	1 Test/2,500 CY delivered 1 Test/2,500 CY in-place

3.8 STORM WATER CONTROLS

3.8.1 Observation Requirements

Storm water controls such as drainage swales, storm water basins, culverts, and associated stormwater infrastructure shall be installed to the line and grade as shown on the Contract Drawings. The CQA Officer is responsible for confirming that materials installed conform to the Technical Specifications Section and the Contract Drawings.

4.0 DOCUMENTATION AND RECORD-KEEPING

The effectiveness of a CQA plan is largely dependent on the ability to properly monitor and document all activities. It is the responsibility of the CQA Officer to observe and document the activities of the Contractors in sufficient detail and with sufficient continuity to provide a high level of confidence and to produce sufficient documentation that the work product complies with the Contract Drawings and specifications. Documentation to be provided by the CQA Officer shall include work summaries of construction activities, laboratory test results, and design and specification revisions.

4.1 DAILY RECORD-KEEPING

The CQA Officer will compile logs which detail such items as the construction activities, observation and testing data sheets, and meetings. The daily construction log should include the quantities and types of material and or equipment installed, the equipment used and the CQA/CQC Officer(s) present at the site. The observation and testing data sheets should include where soil samples are collected and tested, and the sample numbers sent to the lab for testing. All meetings and/or discussions of any construction problems, along with the actions taken to alleviate the problem, shall also be documented.

4.2 OBSERVATION AND TESTING REPORTS

The CQA Officer will compile and maintain a complete record of material test results.

4.3 CHANGES TO SPECIFICATIONS/DRAWINGS

In the event that any design and/or specification changes are required, the CQA Officer shall notify the Certifying Engineer. Design and/or specification changes shall be made only with the agreement of the Certifying Engineer and shall take the form of an addendum to the specifications or Design Drawings.

4.4 DEFICIENCIES/CORRECTIVE MEASURES REPORTS

In the event that problems or work deficiencies arise, the CQA Officer should determine the nature and extent of the deficiency, notify the Contractors and the Certifying Engineer, and properly document the situation. The procedure for handling such a situation is to define and discuss the problem/deficiency, review any alternative solutions, and record the Contractor's implementation of a plan to resolve the problem/deficiency. In the event the issue is not resolved, the CQA Officer or the Certifying Engineer shall notify the Owner.

4.5 RECORD DRAWINGS

After the project has been completed, record drawings should be prepared to document the as-built conditions of the site. The record drawings shall be prepared by the Contractor's registered professional land surveyor and should present the limits and elevations of the components of the base liner system and the overall constructed work product. The Contractor shall also prepare a record drawing showing the geomembrane liner installed, including the approximate locations of panels, field seams, and destructive tests.

4.6 FINAL REPORT

After completion of the construction work, the Certifying Engineer and CQA Officer will prepare a final certification report in accordance with Part 360 2.13. The purpose of this report is to certify that the work has been performed in general compliance with Part 360 requirements, and the Contract Drawings and Specifications, and shall include supporting documentation.

5.0 MEETINGS

5.1 PRE-CONSTRUCTION MEETING

Upon award of the construction contract, a pre-construction meeting will be scheduled with mandatory attendance of the Owner, Engineer, CQA/CQC personnel and the Contractor. The meeting shall address the following topics, at a minimum:

- Distribution of relevant CQA/CQC documents and supporting information, including this document and the Contractors CQC Plan
- Addressing the site-specific CQA/CQC plan and its role relative to the design criteria, plans, and specifications
- Reviewing the responsibilities, authorities and lines of communication for each of the parties involved
- Reviewing the established procedures for observation and testing
- Reviewing the established acceptance and rejection procedures in the CQA/CQC Plan and approved specifications, along with methods and means for decision making and/or resolution of problems regarding data
- Reviewing methods for documenting and reporting all inspection
- Discussing procedures for the storage and protection of landfill construction materials on-site
- Conducting a site walk to review the project site layout and construction material and equipment storage locations.

The meeting minutes from this meeting will become part of the Contract file.

5.2 PROGRESS MEETINGS

Progress meetings should be held on a routine basis. These meetings may be necessary in order to solve problems, improve lines of communication and discuss the status of the project to date. DEC representatives should be invited to each meeting to facilitate communication and improve oversight.

5.3 FINAL VIEWING OF WORK

At the completion of the project, a final viewing of the work should be performed. The Owner, the Certifying Engineer, CQA Officer and Contractors should walk the site to view the construction.