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NI: NOT INCLUDED IN 50% DESIGN SUBMITTAL

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SECTION 24010
MONITORING WELL ABANDONMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the abandonment of monitoring wells identified for decommissioning on the project drawings.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced, shall be applicable. New York State Department of Environmental Conservation's (NYSDEC's) Policy "CP-43: Groundwater Monitoring Well Decommissioning Policy."

1.3 WELL LOCATIONS

A. All existing monitoring wells to be abandoned have been identified on the Contract Drawings (Sheet 1, Sheet 5, and Sheet 6).

1.4 WELL INFORMATION

A. A table that summarizes the well data for each well to be abandoned can be found at the end of this specification.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. Store products and materials at locations where unnecessary handling is avoided and where they will not interfere with the Owner's operations, construction operations or public travel.

2. Cover all grouting materials to protect the materials from hydration by precipitation.

1.6 QUALITY ASSURANCE

A. Registration:

1. All work shall be completed by a well drilling contractor registered in the State of New York, who shall comply with all applicable rules, regulations, and guidelines published by the State of New York regarding performance of the work.

B. Utilities for Construction:

1. Unless otherwise provided for, the Contractor shall furnish his own source of electricity, fuel, and potable water required to perform the work, and shall bear the costs of these services.

C. Protection of Property:

1. The Contractor shall properly protect all surface and subsurface structures and surrounding areas from damage which may result from the methods employed in performing the work. The Contractor shall be responsible for any damages to such structures resulting from his operations. Damaged property shall be

repaired or replaced to a condition which is equal to that which existed prior to damage. The Engineer and the Owner shall have the right to approve these restoration measures.

2. The Contractor shall clear all underground utilities within the proposed work areas by calling Dig Safely New York, municipal authorities, and public utilities of record prior to commencing all work.

D. Health and Safety:

1. Prior to mobilization to the site, the drilling contractor will be responsible for providing a copy of a project specific Health and Safety Plan (HASP) to the Engineer. A copy of the the HASP will be kept on file at Engineer's office for reference. The contractor will also be responsible for meeting the minimum requirements put forth by the Contract Documents. All on-site personnel must have completed the necessary 40-hour HAZWOPER training.

2. The Contractor shall comply with all applicable laws and regulations governing the furnishing and use of safeguards, safety devices, and protection of equipment. The Contractor shall take any necessary precautions to protect the life and health of employees and the public in performance of the work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Bentonite-Cement Grout:

1. Bentonite-cement grout shall consist of Type I Portland cement (refer to ASTM Standard C150), finely ground sodium-bentonite type clay, and potable water. The mixture shall consist of one 94 pound bag of Type 1 Portland cement, 3.9 pounds of bentonite clay powder, and 7.8 gallons of potable water.

B. Bentonite Seal:

1. A one-foot thick bentonite seal consisting of 1/4-inch diameter sodium-bentonite chips hydrated with potable water shall be placed at the top of the bentonite-cement grout column. The seal shall be no less than three (3) inches below the existing site grade.

PART 3 – EXECUTION

3.1 WELL ABANDONEMENT

A. General Requirements:

1. All abandoned wells must be fully sealed in a manner appropriate for site specific geologic conditions to prevent contaminant migration through the borehole.

2. The Contractor shall maintain a complete and accurate record of the well abandonment operation. For each well abandoned, the Contractor shall complete a Well Decommissioning Record (Figure 3 of NYSDEC's Groundwater Monitoring Well Decommissioning Policy) The information to be recorded shall include the well ID, the depth of the well and riser diameter, the name of the driller and drilling company, the date of the decommissioning, type of plugging material used, the volume of materials used, the interval grouted, and the method of placing the plugging material into each well. All records shall be submitted to the Engineer within five (5) business days after the well abandonment is complete.

3. All work shall be completed under the direction of the Engineer's on-site representative.

B. Plugging Procedures:

1. The bentonite-cement grout mixture shall be placed in the well by pumping the mixture down a tremie pipe of a least one-inch inside diameter which has been placed to the bottom of the well to avoid segregation or dilution of the sealing materials. The slurry shall be applied in one continuous operation until the well is filled to within at least three feet of the ground surface elevation. The tremie pipe shall be submerged in the grout during grout placement. Equipment used for pumping the grout shall be of the diaphragm, piston, gear, or helical type. The Contractor shall be responsible for determining the amount of grout required to plug each well.

2. The contractor shall allow the grout mixture to settle a minimum of two hours prior to placing the bentonite seal or backfill soils on the grout. Additional grout, if necessary, should be added to the well borehole to raise the grout level to within at least one foot of the ground surface elevation.

3. A one-foot thick bentonite seal consisting of 1/4-inch diameter sodium-bentonite chips hydrated with potable water shall be placed at the top of the bentonite-cement grout to provide a secondary seal.

C. Removal of Well Materials:

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1. The concrete surface seal and protective steel casings around monitoring wells shall be removed only after the initial grouting of the well is completed.

2. The top 5-feet of PVC well riser shall be removed to by unthreading the PVC joints, cutting the riser pipe, or lifting the riser pipe upward using a cable hoist system or similar tool.

3. All PVC well riser, screen, and protective casings shall be placed beneath the capping system.

C. Decontamination:

1. All down-hole equipment will be thoroughly decontaminated on-site prior to abandoning each well with a high-pressure steam cleaner.

D. Site Restoration:

1. The Contractor shall restore the site to a condition that reasonably approaches the original condition of the property prior to the start of work. After all well boreholes are sealed, the work area shall be graded to conform to the existing ground contours.

2. Upon completion of the work, the Contractor shall remove from the premises, all materials, debris, tools, and machinery used to complete the work. Plugging materials, grease, or other materials, which have accumulated on the work site premises shall be removed. The contractor shall dispose of all excess materials, the well protective casings, and PVC well pipe off-site in accordance with all local, State, and Federal regulations.

Well ID	Well Diameter (Inches)	Well Depth (Feet)
South Landfill		
MW-1S	2*	25
MW-1SD	2	50
MW-2S	2*	25
MW-2SD	2	76
MW-3S	2*	24.5
MW-3SD	2	81
North Landfill		
MW-1	2*	20
MW-2	2*	20
MW-3	2	15
MW-4A	2	14
MW-4B	2	38
MW-5	2	53.5
MW-7	2	64
MW-8A	2	15
MW-8B	2	43
MW-9A	2	14
MW-9B	2	68
MW-10	2	14
MW-12A	2	15
MW-12B	2	64
MW-13	2	14
MW-14	2	14
OW-2	2	12
OW-3	2	12
OW-4	2	12
Total Depth All Wells		803

* Assumed 2” diameter based on incomplete log information

END OF SECTION

DIVISION 3 - EARTHWORK

SECTION 31050
GEOTEXTILES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the installation of separation/stabilization fabric as shown on the Contract Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. The latest edition of the following standards, as referenced herein, shall be applicable.

1. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Product Data:

1. Submit Manufacturer's material specifications, product literature and installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver sufficient materials to the site to prevent interruption of the work.

2. All materials shall be inspected by Contractor upon delivery. Contractor shall notify Engineer of any damage. Products received at the site torn, with holes, deteriorated, or otherwise damaged will not be approved and shall be returned and replaced at no expense to the Owner.

B. Storage:

1. All material shall be stored in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

2. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in way that protects it from elements, if stored outdoors, elevate and protect geotextile with waterproof cover.

C. Handling:

1. All material shall be handled in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

PART 2 – PRODUCTS

2.1 WOVEN GEOTEXTILE

A. Stabilization Fabric: To be used beneath roadways and walks.

B. Composed of polymeric yarn interlaced to foam planar structure with uniform weave pattern.

C. Calendared or finished so yarns will retain their relative position with respect to each other.

D. Polymeric Yarn: Long-chain synthetic polymers (polyester or polypropylene) with stabilizer or inhibitors added to make filament resistant to deterioration due to heat and ultraviolet light exposure.

E. Sheet Edges: Selvaged or finished to prevent outer material from separating from sheet.

F. Unseamed Sheet Width: Minimum 12 feet.

G. Physical Properties:

1. Mirafi 600X or approved equal meeting the following requirements:

Mechanical Properties	Test Method	Unit	Typical Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D 4595	kN/m (lbs/in)	30.0(190)	30.0 (190)
Grab Tensile Strength	ASTM D 4632	N (Ibs)	1638 (368)	1704 (383)
Grab Tensile Elongation	ASTM D 4632	%	27	17
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	690 (155)	623 (140)
CBR Puncture Strength	ASTM D 6241	N (lbs)	6008 (1350)	
Apparent Opening Size (AOS)[1]	ASTM D 4751	mm (U.S. Sieve)	0.18 (80)	
Permittivity	ASTM D 4491	Sec^{-1}	0.11	
Flow Rate	ASTM D 4491	$l/min/m^2$ ($gal/min/ft^2$)	285 (7.0)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	80	

2. Mirafi HP270 or approved equal meeting the following requirements:

Mechanical Properties	Test Method	Unit	Typical Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D 4595	kN/m (lbs/ft)	41.3 (2832)	42.4 (2904)
Tensile Strength (at 2% strain)	ASTM D 4595	kN/m (lbs/ft)	9.1 (624)	11.6 (792)
Tensile Strength (at 5% strain)	ASTM D 4595	kN/m (lbs/ft)	20.7 (1416)	24.3 (1668)
Tensile Strength (at 10% strain)	ASTM D 4595	kN/m (lbs/ft)	37.8 (2592)	42.2 (2892)
Factory Seam Strength	ASTM D 4884	kN/m (lbs/ft)	18.4 (1250)	
Flow Rate	ASTM D 4491	$l/min/m^2$ (gal/min/ft)	2444 (60)	
Permeability	ASTM D 4491	cm/sec	0.05	
Permittivity	ASTM D 4491	sec^{-1}	0.8	
Apparent Opening Size (AOS)[1]	ASTM D 4751	mm (U.S. Sieve)	0.43 (40)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	80	

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for the installation, and seaming of geotextile fabric in accordance with the specifications and the manufacturer's recommendations, as approved by the Engineer.

3.2 SUBGRADE PREPARATION

A. Surfaces to be covered with geotextile fabric shall be smooth and free of rocks, sticks, roots, sharp objects, and all debris that may damage the fabric. The surface to be covered shall be firm and unyielding, with no sudden changes or breaks in grade. There shall be no standing water or excessive moisture on the surface when the fabric is placed.

B. The compacted subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the fabric.

3.3 GEOTEXTILE INSTALLATION

A. The fabric shall be cleaned of all debris or other materials that may negatively affect the fabric's performance.

B. Mechanical equipment shall not be permitted to operate directly on the fabric unless authorized to do so by the manufacturer and approved by the Engineer.

C. Geotextile Placement

1. Fabric shall be placed as recommended by the manufacturer and approved by the Engineer on surfaces which have been prepared to conform with these Specifications and found acceptable for fabric installation.

2. The fabric shall be placed as smooth and wrinkle-free as possible.

3. When installing geotextile in trenches, swales, ditches, etc., overlap geotextile in the direction of flow.

4. All areas of fabric damaged during installation as determined by the Engineer shall be repaired or replaced by the Contractor as specified at no additional cost to the Owner. Should the fabric be damaged during any step of the installation, the damaged section shall be repaired by covering it with a piece of fabric which extends at least 24 inches in all directions beyond the damaged area. The fabric shall be secured by sewing or bonding as approved by the Engineer.

5. At time of installation, fabric will be rejected if it has defects, ribs, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling, or storage. Damaged materials shall be removed and replaced at no additional cost to the Owner.

6. Fabric shall be placed with long dimension down slope.

7. Fabric shall be protected at all times during construction from contamination by surface runoff and any fabric so contaminated shall be removed and replaced with uncontaminated fabric.

D. Seams and Overlaps of Geotextile:

1. All overlaps shall be a minimum of eighteen (18) inches (450 mm).

3.4 COVER MATERIALS OVER GEOTEXTILES

A. Granular materials shall be placed on geotextiles as shown on the Contract Drawings. During back dumping and spreading, a minimum depth of 6 inches of granular material shall be maintained at all times between the fabric and wheels of trucks or spreading equipment. All equipment used in spreading or traveling on the cover layer for any reason shall exert low ground pressures and shall be approved by the manufacturer and Engineer. Dozer blades, etc. shall not make direct contact with the fabric; however, if tears occur in the fabric during the spreading operation, the granular material shall be cleared from the fabric and the damaged area repaired as previously described.

B. The granular material shall be spread in the direction of fabric overlap. Large fabric wrinkles which may develop during the spreading operations shall be folded and flattened in the direction of the spreading. Occasionally, large folds may reduce the fabric overlap width. Special care shall be given to maintain proper overlap and fabric continuity.

C. All equipment spreading cover material or traveling on the cover layer shall avoid making sharp turns, quick stops or quick starts.

E. Fabric shall be covered as soon as possible after placement to minimize exposure to sunlight. Fabric shall not be exposed for more than 5 days.

3.5 DISPOSAL OF SCRAP MATERIALS

A. On completion of installation, the Contractor shall legally dispose of all trash and scrap material offsite or in a location approved by the Owner and Engineer, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner.

END OF SECTION

SECTION 31060
SYNTHETIC GEOMEMBRANE

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes textured synthetic geomembrane.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
2. D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
3. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
4. D 1603 Test Method for Carbon Black in Olefin Plastics
5. D 3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
6. D 4218 Standard Test Method for Determination of Carbon Black in Polyethylene Compounds
7. D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
8. D 5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
9. D 5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
10. D 5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
11. D 5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes
12. D 6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
13. D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes

14. D 7240 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)

B. Geosynthetic Research Institute

1. GRI GM 13 Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

2. GRI GM 17 Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

1.3 SUBMITTALS

A. Submit product data, samples, schedules, and shop drawings describing the work to be performed. Work covered by these submittals shall not proceed until they have been approved by the Engineer.

B. Required submittals include:

1. Manufacturer's qualifications.

2. Liner installer's qualifications.

3. Liner installer's crew foreman, welders and quality assurance/quality control personnel qualifications.

4. Manufacturer's product data and specifications for synthetic geomembrane components.

5. Manufacturer's detailed description of recommended seaming equipment and procedures, including testing.

6. Manufacturer's QA/QC procedures, for both manufacturing and installation.

7. Synthetic geomembrane panel layout detailing seams and sequence of installation.

8. Installation schedule.

9. Material samples of all synthetic geomembrane components, including seams.

10. Manufacturer's recommended maintenance and repair procedures.

11. Details of joints, anchoring, penetrations and other construction details.

C. Submit pertinent record documents including:

1. Manufacturer's quality control certification for all material delivered. Submit certification upon delivery.

2. Results of all destructive and non-destructive seam strength tests performed by the contractor or installer including failed trial welds, test results and subsequent repairs, retests and any imperfection repairs, tests and inspections. Documentation shall include but not be limited to date, location, test unit number, name of tester, type of test and results of each individual test.

3. Record drawings showing panel layout, number, installation sequence and date, locations of destructive seam tests, non-destructive tests, all seam test failures and all repairs and patches.

4. Upon completion of the geomembrane installation and prior to payment for completed work, a complete and comprehensive set of records and record drawings shall be submitted for final review and approval.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer's Qualifications:

a. The synthetic geomembrane manufacturer shall have manufactured 25 million square feet of synthetic geomembrane and at least 5 million square feet of the type listed in this specification.

b. The manufacturer shall permit the Owner and Engineer to visit the manufacturing plant.

2. Liner Installer's Qualifications:

a. The liner installer shall submit to the Engineer documented evidence of their ability and sufficient capacity to perform the work by having previously successfully installed a minimum of twenty (20) million square feet of similar type synthetic geomembrane.

b. The liner installer's crew foreman must have documented minimum qualifications of successful installation experience of at least five (5) million square feet on five (5) different projects.

c. Each of the liner installer's welders shall have documented minimum qualifications of successful welding experience of 100,000 linear feet of seam.

d. Liner installer shall have quality assurance/quality control personnel on site at all times. These personnel will be dedicated solely to performing quality assurance/quality control functions. The quality assurance/quality control foreman will have documented minimum qualifications of successful quality assurance/quality control experience of at least three (3) million square feet, on five (5) different projects. No substitution for QA/QC personnel will be allowed during the course of the project unless approved by the Engineer.

3. Sheet Manufacturer:

a. Documentation for the resin shall be checked against the material as received.

b. Contractor shall supply data on each roll of material documenting that the thickness, density, percent carbon black, melt index, elongation at break and tensile strength at yield and break comply with the product specification.

B. Resin used in sheet manufacture shall be specified by the manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle synthetic geomembrane in accordance with the manufacturer's recommendations. Each roll shall be clearly labeled with the name of the manufacturer, product type, roll number, physical dimensions and date of production.

1.6 WARRANTY

A. Manufacturer shall furnish a material warranty for the synthetic geomembrane material to the Owner. Material warranty shall be for 5 years commencing with the date of final acceptance of the installation.

B. The Contractor shall guarantee the synthetic geomembrane installation against defects in materials, installation and workmanship for 1 year commencing with the date of completion. The guarantee shall include the services of qualified service technicians and all material required for repairs at no expense to the Owner. All welds shall be included in the guarantee. Where the double wedge welding technique is used, both the inner and outer welds along the seam shall be guaranteed.

PART 2 - PRODUCTS

2.1 MATERIAL

A. General:

1. All synthetic geomembrane components shall be new.

2. Synthetic geomembrane material shall be a linear high density polyethylene geomembrane having a nominal thickness of 60 mils and shall be textured on both sides.

3. The synthetic geomembrane material used must have a maximum coefficient of permeability of 1×10^{-12} centimeters per second.

4. The synthetic geomembrane material shall be free of holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Synthetic geomembrane withholes, blisters, undispersed raw material or signs of contamination by foreign material shall be removed from the site and replaced at no additional cost to the Owner.

5. The synthetic geomembrane lining material shall be a minimum 20.0' seamless width. Labels on the roll shall identify the thickness, length, width, manufacturer's mark number, and the direction to unroll the material.

B. Specific:

1. Textured Geomembrane: Textured synthetic geomembrane shall be manufactured from first quality polyethylene resins and meet or exceed the following specifications:

High Density Polyethylene (HDPE) Geomembrane
(TEXTURED)

Tested Property	Test Method	Frequency	Minimum Average Values				
			30 mil	40 mil	60 mil	80 mil	100 mil
Thickness, mil Lowest individual reading	ASTM D 5994	every roll	30 27	40 36	60 54	80 72	100 90
Density, g/cm^3, (min.)	ASTM D 1505	200,000 lbs	0.940	0.940	0.940	0.940	0.940
Tensile Properties (each direction) Strength at Break, lb/in-width Strength at Yield, lb/in-width Elongation at Break, % Elongation at Yield, %	ASTM D 6693, Type IV Dumbbell, 2 ipm G.L. 2.0 in G.L. 1.3 in	20,000 lbs	 45 63 100 12	 60 84 100 12	 90 126 100 12	 120 168 100 12	 150 210 100 12
Tear Resistance, lb	ASTM D 1004	45,000 lbs	21	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	45,000 lbs	45	60	90	120	150
Carbon Black Content, % (Range)	ASTM D 1603*/4218	20,000 lbs	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	45,000 lbs	Note[(1)]	Note[(1)]	Note[(1)]	Note[(1)]	Note[(1)]
Asperity Height, mil	ASTM D 7466	second roll	16	18	18	18	18
Notch Constant Tensile Load[(2)], hr	ASTM D 5397, Appendix	200,000 lbs	300	300	300	300	300
Oxidative Induction Time, min	ASTM D 3895, 200°C; O_2, 1 atm	200,000 lbs	>100	>100	>100	>100	>100

Typical Roll Dimensions						
Roll Length[3], ft	Double-Sided Textured Single-Sided Textured	830 1,010	700 780	520 540	400 410	330 330
Roll Width[3], ft		22.5	22.5	22.5	22.5	22.5
Roll Area, ft^2	Double-Sided Textured Single-Sided Textured	18,675 22,725	15,750 17,550	11,700 12,150	9,000 9,225	7,425 7,425

NOTES:

- [1]Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
- [2]NCTL Textured is conducted on representative smooth geomembrane samples.
- [3]Roll lengths and widths have a tolerance of ± 1%.

C. Chemical resistance of the synthetic geomembrane shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The geomembrane installer shall certify daily in writing that the subgrade surface on which the synthetic geomembrane is to be installed is acceptable.

3.2 PREPARATION

A. Surfaces to be lined shall be smooth and free of rocks, sticks, roots, sharp objects, and all debris that may puncture the synthetic geomembrane. The surface to be lined shall be firm and unyielding, with no sudden changes or breaks in grade.

B. Moisture Content:

1. Allow no standing water or excessive moisture within construction area.

2. Maintain moisture content of the surface soils to receive synthetic geomembrane within three percent low of the optimum moisture until covered by the synthetic geomembrane.

3. Cover all surfaces where moisture content is critical promptly after they have been accepted
for synthetic geomembrane installation.

3.3 INSTALLATION

A. The synthetic geomembrane material shall be cleaned of all debris or other materials that may negatively affect the membrane system.

B. Sheet Placement:

1. The first ten (10) feet of material of each roll shall be inspected prior to placement by the Engineer. Material deemed unsuitable for placement by Engineer shall be discarded at no additional cost to the Owner.

2. Sheets shall be placed as directed by the manufacturer's representative on surfaces which have been prepared to conform with these specifications and found acceptable for membrane installation. A subgrade acceptance form provided by the Engineer shall be prepared and signed daily by the Installer, Contractor and Engineer. Copies of these documents shall be included in the final record documents submitted by the Contractor.

3. The overlap between adjacent sheets shall be a minimum of four (4) inches.

4. The synthetic geomembrane shall be placed over the prepared surface in such a manner as to assure minimum handling. Anchor trench excavation and any structure seal preparation shall be completed before the synthetic geomembrane installation begins. The sheets shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Horizontal field seams on the slopes shall be kept to a minimum. Only those sheets of synthetic geomembrane material which can be anchored and sealed together that same day shall be unpackaged and placed in position. Placement methods shall minimize formation of wrinkles. Wrinkles shall be repaired at the direction of the Engineer.

5. In areas where wind is prevalent, synthetic geomembrane installation shall be started at the upwind side of the project and proceed downwind. The leading edge of the synthetic geomembrane shall be secured at all times with sandbags or other means sufficient to hold it
down during high winds.

6. Sandbags or rubber tires may be used as required to hold the synthetic geomembrane in position during installation. Tires shall not have exposed steel cords or other sharp edges which may snag or cut the synthetic geomembrane. Materials, equipment or other items shall not be dragged across the surface of the synthetic geomembrane or be allowed to slide down slopes on the synthetic geomembrane. All parties walking or working upon the synthetic geomembrane material shall wear soft-sole shoes.

7. Synthetic geomembrane sheets shall be closely fit and sealed around protrusions through the synthetic geomembrane. All piping, structures and other protrusions through the synthetic geomembrane shall be sealed with approved sealing methods, or as shown on the Drawings.

8. Smoking shall not be permitted by personnel working on the synthetic geomembrane.

9. All areas of the synthetic geomembrane damaged during installation as determined by the Engineer shall be repaired by the Contractor as specified at no additional expense to the Owner.

10. No vehicles of any sort will be allowed to operate directly on the liner.

C. Field Seams:

1. All seams shall be made using either the extrusion welding technique or the double wedge welding technique. Field seaming is prohibited when either ambient air or sheet temperatures below 32°F, when the ambient air temperature is above 120°F, when the sheet temperature is above 158°F, during periods of precipitation, or when winds are in excess of 20 miles per hour.

2. All field welds shall have a minimum test strength of 90 ppi with 50% elongation minimum when tested in shear, and 75 ppi with 25% maximum separation when tested in peel. A test revealing a non-film tear bond seam failure shall be deemed a failed test regardless of seam strength. Shear and peel testing shall be performed in accordance with ASTM D 4437.

3. Welding equipment which exhibits an excessive number of "burn-outs" or failing tests, as determined by the Engineer, shall be removed from the project until proof of repair is shown. The engineer may require continuous monitoring of the welding machine by the installer.

D. Extrusion Welding:

1. Field joints shall be made by overlapping adjacent sheets a minimum of four (4) inches and extruding a ribbon of extrusion joining resin between overlapped sheets or over the seam between the sheets according to procedures recommended by the manufacturer.

2. Prior to extrusion welding of the seams, all areas which are to become seam interfaces shall
be cleaned of dust and dirt as directed by the synthetic geomembrane manufacturer's representative. The slick surfaces of the sheet which are to become seam interfaces shall be roughened with a wire brush, grinding wheel or other acceptable means as directed by the synthetic geomembrane manufacturer's representative before extrudate is placed between the overlapping sheets or over a lapped seam.

3. Self-propelled extrusion welders shall be used for welding the lapped seams between sheets.

4. Hand-held extrusion welders shall be used for making repairs and for welding in areas not accessible to the self-propelled welder as directed by the synthetic geomembrane manufacturer's representative.

E. Double Wedge Welding:

1. Field joints shall be made by overlapping adjacent sheets a minimum of four (4) inches or as recommended by the welding machine manufacturer or synthetic geomembrane manufacturer.

2. Prior to double wedge welding of the seams, all areas which are to become seam interfaces
shall be cleaned of dust and dirt as directed by the geomembrane manufacturer.

3. Self-propelled double wedge welders shall be used for welding the lapped seams between sheets.

4. Double wedge welding shall not take place unless the sheet is dry.

5. Hand-held extrusion type welders shall be used for making repairs and for welding in areas not accessible to the self-propelled welders as directed by the synthetic geomembrane manufacturer's representative.

F. Defects and Repairs:

1. All seams and non-seam areas of the geomembrane shall be examined by Installer for identification of defects, holes, blisters, excessive scuffing, wrinkles, distress, undispersed raw materials and any sign of contamination by foreign matter.

a. Defective or damaged materials shall be identified via a deficiency report. Actions taken to resolve or correct the problem will also be recorded on the form.

b. Defects, wrinkles, holes, blisters, undispersed raw materials, signs of contamination by foreign matter, unacceptable welds in geomembranes and other unsatisfactory conditions will be identified on the Daily Report Form. The repair or corrective action to "correct" the problem will also be recorded on a Deficiency Correction Form.

c. Both deficiency and daily reports must be received and approved by the Engineer prior to covering the geomembrane.

2. Each suspect location both in seam and non-seam areas shall be non-destructively tested as
specified. Each location which fails the non-destructive testing shall be marked by Installer and repaired. Work shall not proceed with any materials which will cover locations which have been repaired until laboratory test results with passing values are available. Owner or Engineer may require Installer to perform conformance tests in areas which appear inadequate or damaged. Owner shall pay for tests which show suspect areas are adequate. Installer shall pay for tests which prove suspect areas are inadequate or deficient.

G. Geomembrane Repair Procedures:

1. Any portion of the Geomembrane failing a destructive or non-destructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be decided by the Engineer. The procedures available include:

a. Patching - used to repair large holes, tears, wrinkles, and contamination by foreign matter;

b. Buffing and re-welding - used to repair small sections of extruded seams;

c. Spot welding or seaming - used to repair small tears, pinholes, or other minor localized flaws;

d. Capping - used to repair large lengths of failed seams or wrinkles;

e. Topping - used to repair areas of inadequate seams which have an exposed edge;

2. In addition, the following provisions shall be satisfied:

a. Surfaces of the geomembrane which are to be repaired shall be abraded no more than one hour prior to the repair;

b. All surfaces must be clean and dry at the time of the repair;

c. All seaming equipment used in repairing procedures must be approved;

d. The repair procedures, materials, and techniques shall be approved in advance of the specific repair by the Engineer.

e. Patches or caps shall extend at least 6 in. beyond the edge of the defect, and all corners of patches shall be rounded with a radius of at least 3 inches.

H. Geomembrane Verification of Repairs:

1. All repairs shall be identified on the as-built drawing. Each repair shall be nondestructively tested using the methods described in Paragraph 3.4 (C) of this Section as appropriate. The Engineer may also require repaired areas to be destructively tested. Failed tests indicate that the repair shall be redone and retested until a passing test result is obtained.

3.4 FIELD QUALITY CONTROL

A. Installation Contractor shall employ on-site physical inspection of installation procedures.

B. Contractor shall notify Engineer in writing when material is delivered to site. Contractor will perform conformance tests on material within three (3) weeks of receiving materials. At a minimum, parent material conformance testing shall be performed every 50,000 square feet of liner material delivered to the site. A two foot wide sample along the entire roll width shall be cut after the first lap on the roll is removed and submitted by the Contractor for testing. The following tests shall be performed:

1. Textured Synthetic Geomembrane:

PROPERTIES	TEST METHOD	60 MILS	TESTING FREQUENCY (MINIMUM)
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	Nom. (-5%) -10% -15%	Per roll
Tensile Properties (3) (min. ave.) • break strength – lb/in. • break elongation - %	D 6693 Type IV	90 250	20,000 lb
Puncture Resistance – lb (min. ave.)	D 4833	66	45,000 lb

C. Installation Contractor shall perform physical nondestructive testing on all welds to document airtight homogeneous seams. Testing shall consist of pressure testing on fused seams and vacuum box testing on extrusion welded seams. Engineer shall observe and document that all non-destructive testing of the geomembrane was performed.

1. Air Pressure Testing (ASTM D5820):

a. Equipment for Air Testing:

1) Air pump capable of generating and sustaining a pressure between 20 to 60 psi.

2) Rubber hose with fittings and connections.

3) Sharp hollow needle, or other approved pressure feed device with a sealed and liquid filled pressure gauge capable of reading and sustaining a pressure between 0 and 60 psi in one pound increments.

b. Procedure for Air Testing:

1) Seal both ends of the seam to be tested.

2) Insert needle or other approved pressure feed device into the sealed channel created by the fusion weld.

3) Inflate the test channel to a pressure of approximately 25 to 30 psi, and allow the pressurized channel to stabilize for two (2) minutes. Re-inflate to a minimum of 25 psi as necessary. The initial pressure reading shall be recorded once stabilization has taken place. Close valve, observe and record the initial pressure.

4) Observe and record the air pressure five (5) minutes after the initial pressure setting is recorded. If loss of pressure exceeds 4 psi or if the pressure does not stabilize, locate the suspect area and repair.

5) At the conclusion of all pressure tests, the end of the air-channel opposite the pressure gauge shall be cut. A decrease in gauge pressure must be observed or the air channel will be considered “blocked” and the tests shall be repeated from the point of blockage. If the

point of blockage cannot be found, cut the air channel in the middle of the seam and treat each half as a separate test.

6) Remove the pressure feed needle and seal the resulting hole be extrusion welding.

c. In the event of a Non-Complying Air Pressure Test, the following procedure shall be followed:

1) Check seam and seals and retest seams.

2) If a seam will not maintain the specified pressure, the seam shall be visually inspected to localize the flaw. If this method is unsuccessful, cut one inch (1") samples from each end of the seam.

3) Perform destructive peel tests on the samples using the field tensiometer.

4) If all samples pass destructive testing remove the overlap left by the wedge welder and vacuum test the entire length of seam.

a) If a leak is located by the vacuum test, repair by extrusion fillet welding. Test the repair by vacuum testing.

b) If no leak is discovered by vacuum testing, the seam will be considered to have passed non-destructive testing.

5) If one or more peel specimens are in non-compliance, additional samples shall be taken in accordance with the specifications.

a) When two (2) passing samples are located, the length of seam bounded by the two (2) passing test locations will be considered non-complying. The overlap left by the wedge welder shall be heat tacked in place along the entire length of seam and the noncomplying portion of seam will be extrusion fillet welded.

b) Test the entire length of the repaired seam by vacuum testing.

d. General Air Testing Procedures:

1) The opposite end of the air channel will in all cases be pierced to assure that no blockages of the air channel have occurred.

2) Whenever possible, seams should be air-tested prior to completing butt seams to avoid having to cut into liner. All cuts through the liner as a result of testing will be repaired by extrusion welding.

3) All needle holes in air channels remaining after testing shall be circled by testing crew and will be repaired with an extrusion bead.

e. Air Pressure Testing Documentation:

1) All information regarding air-pressure testing, (date, initial time and pressure, final time and pressure, pass/fail designation, and Technician's initials) shall be written at both ends of the seam, or portion of seam tested. All of this information shall be logged on appropriate forms provided by the Engineer. Test locations and unit numbers shall also be logged by the Installer's QA/QC personnel on appropriate forms provided by the Engineer. These forms will be reviewed daily by the Engineer. The Contractor shall include this information in the record document submittal for the geomembrane.

2. Vacuum Testing (ASTM D5641): This test shall be used on extrusion welds, or when the geometry of a fusion weld makes air pressure testing impossible or impractical, or when attempting to locate the precise location of a defect believed to exist after air pressure testing.

a. Equipment for Vacuum Testing:

1) Vacuum box assembly consisting of a rigid housing with a soft neoprene gasket attached to the bottom, a transparent viewing window, port hole or valve assembly, and a vacuum gauge.

2) Vacuum pump assembly equipped with a pressure controller and pipe connection.

3) A rubber pressure/vacuum hose with fittings and connections.

4) A bucket and means to apply a soapy solution.

5) A soapy solution.

b. Procedure for Vacuum Testing:

1) Trim excess overlap from the seam, if any.

2) Turn on the vacuum pump to reduce the vacuum box to between 3 and 5 psi gauge.

3) Apply a generous amount of a strong solution of liquid detergent and water to the area to be tested.

4) Place the vacuum box over the area to be tested and apply sufficient downward pressure to "seat" the seal strip against the liner.

5) Close the bleed valve and open the vacuum valve.

6) Apply a minimum of 3 psi vacuum to the area as indicated by the gauge on the vacuum box.

7) Ensure that a leak tight seal is created.

8) For a period of approximately 10 to 15 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.

9) If no bubbles appear after 15 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum three inch (3") overlap, and repeat the process.

c. Procedure for Non-Complying Test:

1) Mark all areas where soap bubbles appear and repair the marked areas.

2) Retest repaired areas.

d. General Vacuum Testing Procedures:

1) Vacuum box testing shall be performed by qualified personnel with frequent supervision by the Installers Construction Quality Control Coordinator.

2) Overlap shall be trimmed prior to vacuum boxing all seams.

3) Special attention shall be exercised when vacuum testing "T" seams or patch intersections with seams.

e. Vacuum Testing Documentation:

1) Vacuum testing crew will use permanent markers to write on liner indicating tester's initials, date, and pass/fail designation on all areas tested.

2) All of the above information plus location and test unit number shall be logged by the Installer's QA/QC personnel on appropriate forms provided by the Engineer. The forms will be reviewed daily by the Engineer. The Contractor shall include this information in the record document submittal for the geomembrane.

D. Quality-control technicians, employed by the Installation Contractor, shall inspect each seam. Any area showing a defect shall be marked and repaired by the installation Contractor.

E. Trial Welds: A test weld three feet long from each welding machine and from each operator shall be run twice per day (once in the morning and once in the afternoon) prior to geomembrane welding and under the same conditions as exist for the geomembrane welding. Test welds shall also be run when significant changes in geomembrane sheet temperatures are observed. The test weld shall be marked with date, ambient temperature, and welding machine number. Samples of weld measuring 1 inch x 12 inches shall be cut from the test weld and pulled in peel in the field prior to production welding using a field tensiometer, and recorded as pass or fail regarding the requirements of Section 3.3 - C. If trial test specimens do not pass, then the seaming device and its operator will not perform any seaming operations until the deficiencies are corrected and two successive passing trial seam test specimens are produced. Completed trial seam samples cannot be used as

portions of a second sample and must be discarded. Trial weld samples shall be achieved for potential subsequent laboratory strength testing in accordance with applicable ASTM standards (ASTM D 4437). Documentation of all trials welds shall be logged on appropriate forms provided by the Engineer. The data shall be reviewed by the Engineer prior to the commencement of work each day. The Contractor shall include copies of trial weld reports in the record document submittal for the geomembrane.

F. Destructive Testing: Destructive seam tests shall be performed at random locations. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming. The Owner or Engineer shall select locations where seam samples will be cut. Destructive samples shall be pulled at intervals of 1 sample for every 500 linear feet of weld, at a minimum. At least one representative sample shall be taken for each seaming machine being used on any given day. The seaming technician shall not be informed in advance of the locations where the seam samples will be taken. Seam strength and failure mode shall be as specified in Paragraph 3.3-C of this Section.

1. Samples shall be cut by Installer as the seaming progresses.

2. Installer shall assign a number to each sample which is to be based upon seam and sample number and mark it accordingly.

3. Installer shall record sample location and number on "As-Built" record drawing.

4. All holes in the geomembrane resulting from destructive seam sampling shall be repaired in accordance with repair procedures described in Paragraph 3.3-F of this Section at no additional cost to the Owner. The continuity of the new seams in the repaired area shall be tested according to Paragraph 3.4-c of this Section.

G. Samples for Destructive Tests:

1. Installer, under the Engineers direction, shall take two coupon samples. The coupon samples
shall be 1 inch x 12 inches, and separated by 36 inches.

2. Installer shall test the two coupon samples in the presence of the Engineer. The installer shall test the coupon samples in peel (inner track weld only) and shear, and the sample shall
not fail in the seam (failor shall not be by a non-film tear bond mode). If both coupon samples pass, the Engineer will direct the Installer to collect a sample from between the locations from which the coupon samples were removed. Installer shall cut the sample into three, 12 inch by 12 inch specimens and Engineer will distribute the three specimens as follows:

a. One specimen will be given to the Owner for archive storage;

b. One specimen will be retained by the Engineer should further sampling be required; and,

c. One sample will be shipped by overnight mail to the Contractors/Installers independent geosynthetic laboratory for testing in accordance with ASTM D 4437.

3. Contractor/Installer shall direct the selected geosynthetic laboratory to perform five peel (inner track weld only) and five shear tests. If more than one of the tests fail to meet the strength or failure mode requirements, the seam shall be considered inadequate and the Installer shall repair the seam or retest the seam as required by the specifications.

4. The following procedures shall apply whenever a sample fails a destructive test. Installer has two options:

a. Reconstruct the seam between any two passed test locations;

b. Trace the welding path to an intermediate location [10 feet minimum from the point of the failed test in each direction] and take a small sample for an additional field test at each location. If these additional samples pass the field test, then full laboratory samples shall be taken in accordance with Paragraph 3.4-G of this Section. If these laboratory samples pass the tests, then the seam is reconstructed between these locations. If either sample fails, then the process is repeated (with testing at the Contractor's expense with no additional cost to Owner) to establish the zone in which the seam shall be reconstructed.

1) All acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken.

2) Installer shall document all actions taken in conjunction with destructive test failures; e.g., capping of failed seam area.

H. Any tensile testing which indicates a defective weld shall result in the contractor repairing the weld by capping the weld between two locations where successful welds have been documented by tests. Repaired seam strength shall be as specified in Paragraph 3.3-C of this Section.

I. Alternative test methods or quality control procedures and specifications shall be reviewed and approved by the Engineer prior to use.

J. Installation Contractor shall submit to the Engineer a written description of procedures, sample types and locations and results of laboratory testing described above.

K. No materials shall be placed over any area of installed geomembrane until the installed geomembrane has been accepted by the Engineer. In order to gain acceptance by the Engineer, Contractor shall submit all as-built documentation and test results required by this specification including, but not necessarily limited to, as-built geomembrane panel lay-out, all field installation logs, destructive and non-destructive test logs and results showing passing and failing tests, and repair reports. This information shall be reviewed and approved by the Engineer prior to acceptance of any areas of installed geomembrane and installation of cover materials above the geomembrane.

L. Upon the Engineer's acceptance of the geomembrane installation or portions thereof, the geomembrane shall be covered with proposed geosynthetic and or soil materials as soon as possible to prevent damage to the geomembrane that could be caused by weather conditions or construction activities. Any completed geomembrane that is left uncovered prior to acceptance by the Engineer shall be protected from potential wind damage through the use of sandbags and/or tires to prevent uplift, and protected from construction activities by preventing construction personnel and equipment from entering these areas. In no case shall a geomembranes that has been accepted by the Engineer remain uncovered for longer than 14 calendar days.

M. The Contractor shall maintain and prepare at the site, record drawings which detail and delineate all geomembrane panels, deficiencies, seams, repairs, destructive sample locations, penetrations, roll numbers, seam numbers, and other required information to fully and comprehensively document the as-built condition.

END OF SECTION

SECTION 31160
SITE CLEARING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.

2. Removing existing trees, shrubs, groundcovers, plants, and grass.

3. Clearing and grubbing.

4. Stripping and stockpiling topsoil.

5. Removing above- and below-grade site improvements.

6. Disconnecting, capping or sealing, abandoning site utilities in place and removing site utilities.

1.2 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots.

1.3 MATERIAL OWNERSHIP

A. Except for excess stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

C. Certification: Submit written certification by qualified arborist that trees indicated to remain have been protected during the course of construction in accordance with recognized standards and that where damage did occur, trees were promptly and properly treated. Indicate which damaged trees (if any) are incapable of retaining full growth potential and are recommended to be replaced.

1.5 QUALITY ASSURANCE

A. Stake limits of clearing, grubbing, and stripping, prior to commencing of work.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction. Detour routes shall be identified by adequate signs in accordance with the Manual on Uniform Traffic Control Devices.

B. Protect areas outside limits of disturbance from encroachment by construction personnel or equipment, regardless of property Ownership. Access shall be by specific, written permission or easement only.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Engineer and Owner's Representative.

D. Utility Locator Service: Properly notify utility locator service for area where Project is located before site clearing in accordance with local protocol.

E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

F. Contractor shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the Owner and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag, fence and protect trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer and Owner's Representative and owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer and Owner's Representative written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.2 CLEARING AND GRUBBING

A. Completely remove obstructions, trees, shrubs, stumps, roots, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Use only hand methods for grubbing within tree protection zone.

4. Chip removed tree branches and brush. Re-use as mulch on site.

5. Stumps to be chipped and as mulch on site.

6. All unused materials to remain on-site under the cap.

3.3 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Where trees are designated to remain, stop topsoil stripping and adequate distance from the trees to prevent damage to the main root system.

C. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

D. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).

2. Do not stockpile topsoil within tree protection zones.

3. Dispose of excess topsoil on-site under the cap.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove aggregate base and store for reuse on site.

3.6 DISPOSAL

A. Dispose of all debris and surplus materials on-site under the cap.

B. Dispose of all diseased Elm wood within 4 days after cutting by burning or by other methods approved by the Department of Environmental Conservation.

END OF SECTION

SECTION 31180
EARTHWORK

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the preparation of the site, protection, excavation, embankment, drainage for site grading, as shown on the Drawings, and as herein specified.

B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.

C. The Engineer shall determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at no additional cost to the Owner.

D. Work within or around utility right-of-way shall be performed in accordance with the Right-of-Way Use Restrictions Specification as applicable and under full-time observation of a utility company representative when working within or around utility right-of-way.

E. Dig Safety New York to be notified a minimum of three days prior to start of excavation.

F. Excavation to be performed in accordance with approved excavation work plan and site specific health and safety plan.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. "Standard Specifications, Construction and Materials, New York State Department of Transportation, Office of Engineering".

b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)".

c. "Specifications for Proposed Activities Within NM/NG Easements and Rights-of-Ways".

d. "Specification for Work by Others in NG ROW and Easements".

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control, and other requirements of governmental authorities having jurisdiction, including the State of New York.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications in accordance with Section “Quality Requirements.”

1.3 SUBMITTALS

A. Submit reports for prequalification tests listed in Article "Source Quality Control" of this Section directly from independent testing agency to Engineer, with copy to Contractor.

B. Contractor shall submit detailed manufacturer's data for all proposed compaction equipment, including equipment proposed for use in confined areas.

C. Submit plan detailing proposed borrow source and estimated borrow source quantity. Include copy of NYSDEC mining permit.

1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate support and protection during earthwork operations; comply with OSHA requirements.

2. Coordinate interruption or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hour notice to the Owner and receive written notice to proceed before interrupting any utility.

4. Demolish and completely remove from the site any existing underground utilities designated to be removed as shown on the Drawings or as specified in Section "Clearing and Grubbing."

5. Repair any damaged utilities as acceptable to the Engineer, at no additional cost to the Owner.

C. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work, and post with warning lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

4. Perform excavation within drip-line of large trees to remain by hand, and protect the root system from damage or dry out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Daily and Intermediate Cover: Sound, durable sand, gravel, stone or blends of these materials, free from organic, frozen or other deleterious materials.

1. Gradation:

Sieve	Percent Passing
1"	100
No. 200	0-20

2. Material passing No. 40 sieve shall be non-plastic.

B. Coarse Aggregate: Crushed stone or crushed gravel meeting the Material Requirements established in Section 703-02, Coarse Aggregate of the NYSDOT's "Standard Specifications."

1. Gradation: As specified on Drawings.

2. Physical Requirements: As specified in Table 703-2 and 703-3 of the NYSDOT's "Standard Specifications."

C. Select Structural Fill: Sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of NYSDOT Section 203-2.02C and meeting the following gradation requirements:

Sieve	Percent Passing
4"	100
No. 40	0-70
No. 200	1-10

1. Fines passing No. 200 shall be non-plastic.

2. Particle size analysis shall show no gap grading.

D. Selected Fill: Sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials.

Sieve	Percent Passing
4"	100
No. 40	0-70
No. 200	1-10

1. Fines passing No. 200 shall be non-plastic.

2. Particle size analysis shall show no gap grading.

3.2 SOURCE QUALITY CONTROL

A. Contractor shall employ the services of an independent testing agency in accordance with Section "Quality Requirements" to perform the prequalification tests listed in the Paragraphs of this Article.

B. Notify Engineer when and where sampling will take place. Provide 5 working day notice. The Engineer may elect to witness borrow source sampling.

C. Three (3) representative samples shall be obtained from each potential borrow source. If different material gradations are known to exist in the pit, samples shall be obtained for each material proposed for use in the Work. Each sample shall be collected in accordance with ASTM D 75 - Practice for Sampling, Aggregates, and if necessary, reduced to test specimen size in accordance with ASTM C707 - Standard Practice for Reducing Field Samples of Aggregate to Testing Size. The tests shall be performed in the order shown. Failure to pass any test is grounds for disqualification of the material.

D. Three (3) test reports completed within three (3) months prior to construction may be submitted for suppliers of coarse aggregates in lieu of prequalification tests as approved by Engineer.

E. Daily and Intermediate Cover:

1. Particle Size Analysis:

a. Method: ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.

b. Number of Tests: Three (3) per potential source.

2. Plasticity Index:

a. Method: ASTM 4318 - Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

b. Number of Tests: Three (3) per potential source.

E. Coarse Aggregate:

1. Per Table 703-2 of the NYSDOT's "Standard Specifications."

2. Particle Size Analysis:

a. Method: ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.

b. Number of Tests: Three (3) per potential source.

c. Acceptance Criteria: Gradation within specified limits.

G. Select Fill: A 100-pound minimum representative sample shall be obtained from each potential borrow source. If different material gradations are known to exist in the pit, samples shall be obtained for each material. Each sample shall be mixed thoroughly and reduced to test specimen size, in accordance with AASHTO T87. The test shall be performed in the order shown. Failure to pass any test is grounds for disqualification and shall lead to cessation of the test program for that material.

1. Particle Size Analysis:

a. Method: ASTM D422.

b. Number of Tests: One (1) per potential source.

c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:

a. Method: ASTM D1557, Modified Proctor.

b. Number of Tests: One (1) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

PART 3 – EXECUTION

3.1 PREPARATION

A. Establish required lines, levels, contours and datum.

B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to the Owner.

C. Establish location and extent of utilities before commencement of grading operations.

3.2 EXCAVATION

A. Excavation shall consist, in general, of the excavation of whatever material is encountered to the lines, grades and sections shown on the Drawings, including excavation as necessary for grading and installation of the Work.

B. All suitable materials removed in excavation shall be used in the construction of embankments, subgrade, slopes and at such other places as directed. The Engineer shall be the sole judge of what constitutes suitable material.

C. During construction, the grading operations shall be executed in such a manner that the excavation will be well drained at all times. All grading shall be finished on neat, regular lines conforming to the sections and contours shown on the Plans.

D. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.

E. Excavation shall be performed in proper sequence with all other associated operations.

F. Maintain the slopes of excavation in a safe condition until completion of the grading operation.

G. All excavation work shall be inspected and approved by the Engineer before proceeding with construction.

H. Any excess excavation shall be removed from the site to disposal areas at the Contractor's expense.

3.3 FILL

A. Conduct filling and backfilling using materials specified on the Contract Drawings and in these specifications.

B. Before depositing fills, the surface of the ground shall be cleared of all refuse, brush and large stones.

C. Prior to placing fill over undisturbed material, scarify to a minimum depth of six (6) inches.

D. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be plowed or scarified and where the slope ratio of the original ground is steeper than 2 horizontal to 1 vertical, the bank shall be stepped or benched.

E. The original ground shall be proof rolled until the underlying soil is thoroughly compacted to the satisfaction of the Engineer before any filling is begun. A steel-wheel tandem roller weighing 8 to 10 tons or equipment capable of obtaining the same compactive effort shall be used to obtain a thoroughly compacted subgrade. Remove or recompact any soft or loose soils as determined by the Engineer prior to filling.

F. A thoroughly and satisfactorily compacted subgrade is defined as having a minimum dry density of 90 percent of the maximum dry density of the material. The subgrade material shall be compacted at a moisture content suitable for obtaining the required density.

G. Place backfill and fill materials in layers not more than 12" in loose depth. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with 12" as a maximum lift height. An 8 ton vibratory compactor shall make a minimum of four passes over all fill materials. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water or extraneous debris.

H. When work is suspended during periods of freezing weather, measures shall be taken to prevent fill already in place from freezing. Upon resumption of work after any inclement weather, prepare the exposed surface by proof rolling to identify any zones of soft/loose soils. Soft/loose materials or frozen soils shall be removed and replaced by compacted granular fill.

I. Moisture Control:

1. Where fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface of each layer of fill or backfill. Prevent ponding or other free water on surface subsequent to, or during, compaction operations.

2. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to the specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum dry density specified.

J. All fill shall be thoroughly and satisfactorily compacted to 90 percent of the maximum dry density of the material used.

3.4 GRADING

A. The present and proposed grade lines are shown on the Contract Drawings. Grade over the entire area, as shown on the Drawings, shall be to the proposed grade levels. Upon completion of this work, all debris shall be cleaned out and removed from the premises.

B. All cutting, filling, backfilling and grading necessary shall be done to bring the area to the following grade or subgrade levels:

1. For roadway surface areas; to the finished subgrade levels specified on the Contract Drawings.

2. For areas to be topsoiled and seeded; to within 6-inches of the finished grade.

3. For other surface treatments; as detailed on the Drawings.

C. Sufficient grading must be done during the progress of the work so that the entire site shall be well drained and free from water pockets.

D. Finish grading, including dressing swales, cleaning up excess footing excavation, dressing terraces, disposing of excess material and all other work necessary to prepare the site for topsoil and seeding shall be done after construction of structures and roadway surface areas is substantially complete.

3.5 COMPACTION EQUIPMENT

A. Compaction equipment used for the Work is subject to approval by the Engineer. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics.

3.6 DRAINAGE

A. Prevent surface, subsurface or ground water from flowing into excavation and from flooding project area, as well as surrounding areas.

B. Do not allow water to accumulate in excavations. Remove water to prevent softening of subgrades.

C. Provide and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations by dewatering to collection or run-off areas.

3.7 FIELD QUALITY CONTROL

A. Notify the Engineer at least one (1) working day in advance of all phases of filling and backfilling operations.

B. Contractor shall notify Engineer two working days prior to performing in place density testing. Contractor shall perform in place density tests in accordance with ASTM D 2922: Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (shallow depth) at a minimum frequency of nine (9) tests per lift per acre. Acceptance criteria is a minimum in place dry density of 90% of the standard Proctor maximum dry density with moisture content within three (3) percent of the optimum moisture content unless noted otherwise. If a test fails to qualify, the fill shall be further compacted and retested. Subsequent test failures shall be followed by removal and replacement of the material at no additional cost to the Owner.

C. Contractor shall perform the following tests each time 2,000 cubic yards of Intermediate Cover and cushion layer soil material is brought on site and placed.

1. ASTM D 422: Method for Particle-Size Analysis of Soil.

a. Frequency: One (1) representative sample per 2,000 cubic yards of material placed.

b. Acceptance Criteria: Within specified gradation.

2. ASTM D 698: Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.

a. Frequency: One (1) test per 2,000 cubic yards of material placed.

D. Engineer will direct Contractor to perform additional tests to establish gradation, maximum density, and plasticity if the quality of the materials change.

3.8 CLEAN UP

A. Provide and maintain protections of newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing.

B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.

C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION

SECTION 31190
GAS VENTING LAYER

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the gas venting layer as shown on the Contract Drawings and as specified herein.

B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.

C. The Engineer will determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. The latest edition of the following standards and regulations, as referenced herein, shall be applicable.

1. American Society for Testing and Materials (ASTM).

2. Standard Specification for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

3. 6 NYCRR Part 360 Solid Waste Management Facilities.

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control, and other requirements of governmental authorities having jurisdiction, including the State of New York.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils with the specifications, in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. The Contractor shall furnish representative earth materials to the testing laboratory for analysis and report, as directed by the Engineer or as outlined in the specifications.

B. Descriptive information on compaction equipment to be used for construction of the barrier layer, including equipment proposed for use in confined areas.

C. Plan detailing proposed borrow source, borrow source prequalification testing data, and estimated borrow source quantity. A copy of the NYSDEC mining permit for the borrow source shall be included in the plan.

D. Schedule of placement.

E. Test reports for prequalification and construction quality control/quality assurance testing shall be submitted to both the Contractor and Engineer.

1.4 PRODUCT HANDLING

A. Soil materials shall be excavated from the borrow source, transported, conditioned, placed, and stockpiled in such a manner so as to prevent contamination, segregation, and excessive wetting. Materials that have become contaminated, excessively wet, or segregated shall not be used and shall be removed from the site.

PART 2 – PRODUCTS

2.1 MATERIALS

A. The gas venting layer shall be a geosynthetic drainage layer fabric as shown on the Contract Drawings and specified in Section 31350 unless an alternate is required by the NYSDEC. If an alternate is required, it shall conform to this section.

B. Select Granular Material (for use in gas venting layer): Sound, durable, sand, gravel, stone or blends of these materials, free from organic, frozen, or other deleterious materials, conforming to the following requirements:

Sieve	Percent Passing
1"	100
¼"	30-65
No. 40	5-40
No. 200	0-10

1. Fines passing No. 200 sieve shall be non-plastic.

2. Particle size analysis shall show no gap grading.

3. The permeability of the gas venting layer shall be greater than 1x10-3 centimeters per second when compacted to a minimum of 90 percent of standard Proctor maximum dry density.

4. All soil or stone particles shall be classified as rounded or sub-rounded (ASTM D 2488)

5. Internal angle of soil friction shall be equal to or greater than 29° when compacted to 90% standard proctor maximum density.

6. Interface friction angle between geo-synthetic shall be equal to or greater than 29° when compacted to 90% standard proctor maximum density.

PART 3 – EXECUTION

3.1 BORROW SOIL PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. General:

1. Sufficient size samples shall be obtained from the potential borrow source to allow completion of tests listed in paragraph B below. Samples may be obtained from test borings, test pits, or from borrow pit faces provided that surficial dry or wet soil is removed to expose undisturbed earth. Tests listed below shall be performed on each sample obtained. A minimum of three (3) representative samples from each potential borrow source shall be furnished to the testing laboratory for prequalification testing. Test data shall be provided to the Engineer a minimum of 2 weeks prior to start of gas venting layer construction for approval of borrow source.

B. Material Tests:

1. Particle Size Analysis:

a. Method: ASTM D422

b. Number of Tests: One (1) per sample; three (3) samples per source.

c. Acceptance Criteria: Gradation within specified limits.

2. Atterberg Limits Determinations:

a. Method: ASTM D4318

b. Number of Tests: One (1) per sample; three (3) per potential source.

c. Acceptance Criteria: Plasticity index within specified limits.

3. Moisture Content:

a. Method: ASTM D2216

b. Number of Tests: One (1) per sample, three (3) per potential source. Test shall be performed on sample specimen preserved at natural (undisturbed) moisture condition.

4. Maximum Density Determination:

a. Method: ASTM D698 - Standard Proctor

b. Number of Tests: One (1) per sample, equaling three (3) per potential source.

5. Permeability of Granular Soils:

a. Method: ASTM D2434 - Constant Head Method

b. Number of Tests: One (1) tests per sample performed with sample compacted to a minimum of 90% maximum standard Proctor maximum dry density.

1.) Total number of tests per sample: 1

2.) Total number of samples per source: 3

c. Acceptance Criteria: Coefficient of permeability greater than 1x10-3 centimeters per second.

6. Internal angle of soil friction and cohesion:

a. Method: ASTM 3080 - Direct shear test.

b. Number of Tests: One (1) test series per sample. Test series shall consist of three (3) identical specimens from each sample subjected to direct shear test using normal (vertical) stresses of approximately 1 pound per square inch (psi), 2 psi and 4 psi. Test specimens shall be compacted to 90% of standard Proctor maximum dry density.

1.) Total number of specimens shear tested per sample: 3.

2.) Total number of specimens shear tested per potential borrow source: 9.

7. Interface Friction Angle:

a. Method: ASTM 3080 - Direct shear test with apparatus modified to test a minimum 12" by 12" (plan size) soil specimen and to firmly and uniformly hold geosynthetic material in place. Deformation of geosynthetic material shall not be permitted.

b. Number of Tests: One (1) test series per potential borrow source for each of the synthetic materials listed in paragraph 7-d below. Test series shall consist of three (3) identical specimens from one of the three borrow source samples subjected to shear test using normal (vertical) stresses of approximately 1 psi, 2 psi, and 4 psi. Test specimens shall be compacted to 90% of standard Proctor maximum dry density.

c. Acceptance Criteria: Friction angle greater than or equal to 29°. The purpose of the test is to verify design friction angles.

d. Synthetic to be used for interface shall be same type and manufacturer use and during construction.

1.) Geotextile filter fabric meeting specifications described in Section "Geotextiles";

2.) Geomembrane materials meeting specifications described in Section "Synthetic Geomembrane."

3.2 PLACEMENT AND COMPACTION

A. General:

1. Do not place fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water or extraneous debris.

2. When work is suspended during periods of freezing weather, measures shall be taken to prevent fill already in place from freezing. Upon resumption of work after any inclement weather, prepare the exposed surface by proof rolling to identify any zones of soft/loose soils. Soft/loose materials or frozen soils shall be removed and replaced.

3. The distribution of materials throughout the gas venting layer shall be such that the layer will be free from lenses, pockets, streaks, and layers of materials differing substantially from the surrounding materials.

4. The placing of material shall be done so as to obtain a layer of uniform thickness without spaces between successively deposited loads.

5. Compaction of each layer shall proceed in a systematic, orderly, and continuous manner so as to ensure the specified coverage by the compaction equipment.

6. Materials which cannot be compacted by the approved rolling compaction equipment because of interferences shall be compacted with smaller approved compactors to a density at least equal to the density achieved in adjacent areas by the rolling compaction equipment
and methods. Single pad vibratory base plate compactors shall weigh not less than 200 lbs. and have a vibration frequency not less than 1600 cycles per minute.

7. Should the fill surface become rutted or uneven subsequent to compaction, it shall be re-leveled and re-compacted before placing the next layer of material.

8. Fill on landfill side slopes shall be placed in lifts parallel with the sloping surface.

B. Gas Venting Layer Placement and Compaction:

1. Place fill materials in a layer not less than 6" in compacted depth. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction. The moisture content of the material during compaction shall be between 3 percent wet and 3 percent dry of optimum moisture content as determined by ASTM D698 (standard Proctor)

2. All fill shall be thoroughly and satisfactorily compacted to at least 90 percent of the standard Proctor maximum dry density of the material used (ASTM D-698).

3. Where fill must be moisture conditioned before compaction, uniformly apply water to the surface of each layer of fill. Prevent ponding or other free water on the surface subsequent to, or during, compaction operations.

4. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to the specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

5. Rolling compaction equipment shall be heavy smooth drum vibratory equipment capable of achieving the intended result. Compaction equipment used for the Work is subject to approval by the Engineer. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics.

6. Compaction equipment shall make a minimum of 4 complete passes over the entire area of each lift.

7. The Contractor shall grade partially completed fill areas for drainage and thoroughly compact and smooth the surface at the end of each workday.

8. For areas not accessible to heavy rolling compaction equipment, fill materials shall be placed in horizontal layers not to exceed 6 inches in loose thickness and compacted with smaller rolling compaction equipment or hand operated equipment, as approved by the Engineer.

9. The final surface of the layer shall be uniform and suitable for placement of the next subsequent layer.

3.3 FIELD QUALITY CONTROL

A. The Contractor's Testing Laboratory shall perform testing of gas venting layer materials to insure compliance with these specifications.

B. A grain size analysis shall be performed in accordance with ASTM D422 for every 1000 cubic yards of select granular material placed.

C. In-place density and moisture content tests shall be performed on in- place fill material in accordance with ASTM D 1556, D 2167 or D 2922. In-place density shall be determined at a depth of 3 inches below grade. At least 9 tests shall be performed per acre per lift of material placed and at least one test shall be performed each day. Field test locations shall be subject to approval or relocation by the Engineer.

D. Tests for moisture content shall be performed on the in-place fill at a rate of nine tests per acre per lift. If nuclear methods or microwave methods are used to determine field moisture content, one oven-dry

moisture content determination (ASTM D2216) shall be performed per acre per lift for calibration. Sample shall be obtained from a location immediately adjacent to an in-place density location.

E. The Engineer may direct additional tests to establish gradation, Atterberg limits, permeability, maximum density, and in-place density, and water content as required by working conditions, or changes in borrow source material at the Contractor's expense.

F. Acceptance Criteria:

1. Grain size analyses shall show gradation of the soil material placed to be within specified limits.

2. Minimum dry density for all fill shall be 90 percent of the standard Proctor maximum dry density. The in-place moisture content shall be within 3 percent dry or 3 percent wet of optimum as determined by the standard Proctor compaction method (ASTM D-698). If a test fails to qualify, the fill shall be further reworked, compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

3.4 CLEAN UP

A. Provide and maintain protection of newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing if any.

B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.

C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION

SECTION 31200
WASTE EXCAVATION AND RELOCATION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the excavation of waste which includes but is not limited to excavating, hauling, placing, and compacting waste on existing landfill surface.

B. The contractorr shall also provide suitable barricades, warning lights, signs, etc., to protect excavations, and provide health and safety protection and monitoring.

C. Work shall be performed under the full-time supervision of the Contractor's Health and Safety Officer (HSO).

D. Work shall be performed under full-time observation of a utility company representative when working within or around utility right-of-way.

E. Dig Safety New York to be notified a minimum of three days prior to start of excavation.

F. Excavation to be performed in accordance with approved excavation work plan and site specific health and safety plan

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. Standard Specification for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

C. 6 NYCRR Part 360 Solid Waste Management Facilities, including 360-2.18.

D. Occupational Safety and health Administration (OSHA).

E. 6 NYCRR Part 753.

F. "Specifications for Proposed Activities Within NM/NG Easements and Rights-of-Ways".

G. "Specification for Work by Others in NG ROW and Easements".

1.3 SUBMITTALS

A. Contractor shall submit a detailed excavation work progression and materials staging plan with construction schedule. This plan shall address control of surface water, dewatering methods, protection of exposed, clean natural soils from contamination. Plan shall include equipment and materials to be used, including safety and excavation equipment.

B. Support system drawings.

1.4 QUALITY ASSURANCE

A. Contractor shall not backfill excavated areas without prior approval of Engineer. Engineer will confirm that the target depth or bottom of waste has been reached and all waste and contaminated soil has been removed from area, prior to backfilling.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Intermediate cover soil material as specified in Section "EARTHWORK" or synthetic cover material approved by the Engineer.

B. Waste - Garbage, rubble, construction and demolition debris, white goods, all other wastes regulated under 6 NYCRR Part 360, and existing soil cover material. Waste shall also include contaminated soil and sediment as indicated on the drawings.

C. Clean sand pipe backfill as specified in Section “Trenching and Backfilling”.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate waste and soil material from the landfill as shown on the Contract Drawings to the grades indicated.

B. Divert surface water away from the excavation at all times.

C. Temporary cut slopes shall be in accordance with OSHA requirements.

D. Maintain the smallest open face of waste practical, to minimize emission of gas and odors.

E. Excavated areas shall be regraded, after excavation is complete, and accepted by the Engineer to create a uniform surface. Positive surface drainage shall be maintained toward designated on-site locations shown on the Contract Drawings.

F. Final surface of area shall be suitable for the placement of subsequent materials such as topsoil, intermediate cover, and/or gas venting soil.

G. Any hazardous waste materials excavated shall be handled by the Contractor as specified in the Contractor’s health and safety plan, contract documents, and applicable regulations and specifications. A temporary storage area shall be designated prior to excavation procedures.

H. Measures shall be taken by the Contractor to remove ponded water from the waste mass.

I. Excavation area shall be outlined in white paint prior to excavation.

J. Utilities in and around excavations shall be identified and marked by Utility Representatives prior to excavation.

K. Excavations near utilities shall not start prior to approval by Utility Representatives.

L. No equipment shall work directly over a utility, the utility location to be clearly marked.

M. When working in utility right-of-way, teeth of bucket shall be covered with a welded plate and side cutters removed.

N. No excavation shall be performed to impair, withdraw lateral support from underground utility, accumulate water or cause damage.

O. If required, sand or cement bags will be placed to support the utility. Work will not be permitted until support is installed. Support shall also include hangers, shoring, and bracing. Support system shall be in accordance with utility requirements.

P. No buried utility to be exposed without utility approval.

Q. Engineer to be notified if unusual conditions encountered.

3.2 PROTECTION

A. Protect excavated areas with temporary barricades, warning lights, signs and other protection devices until hazard created by excavation is eliminated by completion of work in such areas.

B. Review the location of utilities shown on the Contract Drawings, and protect any utilities in the vicinity of waste excavation areas. The Contractor shall be responsible for verification of actual locations of utilities shown on the Contract Drawings.

C. The Contractor shall notify the Engineer of unknown utility locations not shown on the Contract Drawings, and shall stop all work in areas of such utilities until notified to resume work by the Engineer.

D. The Contractor shall provide health and safety protection equipment and monitoring in accordance with all federal, state, and local requirements, and the requirements of the General Contract.

3.4 NIAGARA MOHAWK/NATIONAL GRID REQUIREMENTS

A. All work within the NM/NG rights-of-way and easements shall be in accordance with the following conditions (copies attached):

1. National Grid USA Companies "Conditions for Proposed Activities Within Electric Transmission Line Rights-of-Way".

2. "Specifications for Work by Others on NM/NG Easements and Rights-of-Ways containing Gas Facilities".

B. A gas-qualified inspector will be assigned to monitor & protect National Grid's electric facilities during construction activities in the vicinity of the affected ROW and easements.

1. This inspector will ensure that all Gas Department's construction requirements are adhered to by the contractor.

2. Corrective action & repairs will be initiated as required to correct damage to National Grid's gas facilities.

C. All existing test stations and marker posts will remain in their current location. If a test station is broken during construction the Contractor must notify the Owner, who will notify National Grid so the test station can be repaired. The Contractor will be responsible to reimburse the Owner for National Grid costs to replace the marker posts or test stations.

H. Any costs incurred by National Grid to provide Watch Guard services will be reimbursed by the Contractor.

I. Future Needs - National Grid will need unrestricted access to this site to perform routine construction and maintenance activities.

3.5 BUCKEYE REQUIREMENTS

A. In accordance with their "Right-of-Way Use Restrictions Specifications."

3.6 ONONDAGA COUNTY REQUIREMENTS

A. Excavation and earthwork shall be limited to as directed by the Engineer at any easement and shall not extend further than required into the easement.

B. The maximum depth of any cut within the easement shall as directed by the Engineer.

C. The thickness of cover directly over any existing sewer shall not be increased or decreased.

D. All areas disturbed within any easement should be top-soiled and seeded.

END OF SECTION

EXHIBIT B
National Grid USA Companies
Conditions for Proposed Activities
Within Electric Transmission Line Rights-of-Way

1. Compliance/Safety

A. All activities conducted by the Licensee shall comply with all applicable Federal, state, and local laws, statutes, rules, regulations, and codes. In particular, the requirements of the following statutes, regulations, and safety codes and guidelines must be met:

- *National Electrical Safety Code*
- In Massachusetts, 220 CMR 125.00, "Installation and Maintenance of Electric Transmission Lines"
- In New York, Part 57 of the New York State Industrial Codes Rules (also known as the "High-Voltage Proximity Act")
  http://www.labor.state.ny.us/business_ny/employer_responsibilities/safety/s57.htm
- **OSHA regulations governing working clearances from energized lines. OSHA Standard 29 CFR 1926.550 Subpart N is specific to cranes, derricks, hoists, elevators, and conveyors. However, all vehicles, equipment, and loads shall maintain the minimum clearances from energized wires that are specified in this Standard unless a more restrictive standard applies.**
- **Licensee must contact New York State's one-call system, "Dig Safely New York" (aka UFPO) at 800-962-7962 prior to any excavation work on the Easement or Property. In addition, Licensee agrees to comply with Public Service Law Section 119-b and General Business Law Article 36, which implement the Public Service Commission regulation 16 NYCRR Part 753 (formerly Industrial Code Rule 53) regarding protection of underground facilities (including any and all updates thereof), and take any and all reasonable measures to protect and secure worksite from entry by the general public.**

B. The Licensee shall adequately ground vehicles, equipment, fences and gates, at all times and in accordance with applicable Federal, state, and local laws, statutes, rules, regulations, and design codes, including, but not limited to, those listed in paragraph A above and IEEE Standard 80.

C. No men or equipment or combination thereof shall come closer than 15 feet to any energized conductor.

D. UFPO shall be notified prior to any excavation specifically but not limited to the purpose of identifying and locating Niagara Mohawk's facilities. Extreme caution shall be used during excavation to insure that Niagara Mohawk's facilities are not disturbed. The Licensee shall be responsible for all repair costs of damages incurred to Niagara Mohawk facilities which are a result any excavations or other activities conducted by the Licensee.

2. **Protection of Transmission Line Facilities**

The Licensee shall, at all times, protect transmission line facilities from damage. In addition to compliance with safety codes as described in paragraph 1 above, protection of transmission facilities shall, as a minimum, include the following, unless otherwise approved in writing by National Grid:

A. The Licensee shall operate equipment and vehicles at least 50 feet horizontally away from any transmission line pole, tower, guy wire, or guy anchor.

B. When making a rough cut during excavation, the Licensee shall disturb no earth within an area bounded by a line drawn 25 feet plus 2.5 times the depth of the cut from the nearest transmission line pole, tower leg, guy wire, or guy anchor, but not less than 50 feet. Upon completion of the rough cut, the slopes of the bank shall be graded on a slope no steeper than one vertical to five horizontal and stabilized with vegetation or rip-rap. The top of the slope shall be at least 50 feet from the nearest pole, tower leg, guy wire, or guy anchor.

C. The Licensee shall not store or use explosives within the right-of-way.

D. No construction materials or debris, excavated soils, explosives, junk vehicles or other trash of any kind shall be stockpiled or disposed of on the Easement and Property, and no oil or hazardous wastes or substances shall be stored or disposed of on the Easement and Property.

E. The Licensee shall not unload or load vehicles or equipment within the right-of-way.

F. The Licensee shall place no above or below ground structures within the right-of-way, including, but not limited to, streetlights, signs, sheds, fences, septic systems, and swimming pools.

G. The Property shall not be used as a staging or marshalling yard for contractors, employees, equipment or materials.

H. No parking or storage of vehicles of any kind is allowed on the Easement or Property including, but not limited to, automobiles, trucks, all-terrain vehicles (ATV's), four-wheel vehicles and boats.

3. **Access to Right-of-way**

A. The Licensee shall not at any time block or impede access to or along the right-of-way.

B. The Licensee shall not damage roads or trails used to gain access to or along the right-of-way.

4. **Preservation of Rights and Future Use**

A. Licensor reserves the right to determine any area(s) where improvements will not be permitted due to its need for these area(s) for its future facilities. This includes the bisector of angles in the right-of-way and generally includes areas adjacent to existing structures.

5. **Protection of Interests**

A. Mild shocks due to electrostatic currents may be felt when touching conductive structures or objects within the right-of-way. Although these shocks may be annoying, Licensor is unable to eliminate them.

6. **Additional Conditions**

A. Licensee shall install suitable two-inch (2") plastic markers, extending a minimum of three (3') feet above ground, at the point of entrance and exit of any pipelines, cables or other underground facilities installed by Licensee on the Easement.

B. Licensee shall notify Licensor of any survey monument, marker or stake that has become dislodged, lost or misplaced during installation of Licensee's facilities. Licensor will resurvey the Easement and replace any such survey monument. Resurvey expense shall be reimbursed by Licensee to Licensor.

C. In the event Licensor determines that injury or damage to, or interference with, its facilities may occur as a result of loss of metal from Licensor's, Licensee's or a third party's facilities due to corrosion or electrolysis caused or hastened by the installation of Licensee's facilities or by Licensee's activities, Licensor may require the following protective measures to be taken by Licensee. Licensee shall cover said facilities and shall install and maintain cathodic protection devices, all subject to prior approval of Licensor. Licensee shall keep accurate records of each such cathodic protection device, furnish Licensor with a copy of such records, and shall from time to time take such other and further protective measures as Licensor may require.

D. Licensee shall install, maintain and provide adequate drainage facilities so that there will not be a collecting or pooling of surface or run-off waters upon the Easement or Property resulting from the installation, construction, maintenance and operation of Licensee's Easement and facilities.

E. Licensee shall provide not less than thirty (30") inches of cover over any underground facilities installed by Licensee pursuant hereto; such cover shall be compacted so as to be capable of withstanding AASHTO H20 highway load rating.

F. Licensee is hereby notified that other underground physical occupations of the subject Easement may exist that do not appear upon the attached drawing and/or maps and property records maintained by Licensor. Accordingly, Licensee is cautioned to excavate carefully and comply with all applicable state and local laws and regulations with respect thereto.

7. **Insurance Requirements**

A. **Coverage:** From the commencement of the License, through final expiration or longer where specified below, Licensee shall provide and maintain, at its own expense, insurance policies, intended to be primary (with no right of contribution by any other coverage available to National Grid and its subsidiaries (National Grid), covering the Permitted Uses, including, without limitation, all recreational activities, under or in connection with this License, issued by reputable insurance companies with an A.M. Best Rating of at least B+, which meet or exceed the requirements listed herein:

1. **Workers' Compensation and Employers Liability insurance** as required by the State in which the work activities under this License will be performed. If applicable, coverage shall include the U.S. Longshoreman's & Harbor Workers Compensation Act, and the Jones Act. The employer's liability limit shall be at least $500,000 each per accident, per person disease, and disease by policy limit.

2. **Commercial general liability (CGL) Insurance,** covering all the Permitted Uses to be performed by or on behalf of Licensee or its Invitees under or in connection with this License, with **minimum** limits of :

Bodily Injury (BI)	- $1,000,000 per occurrence
Property Damage (PD)	- $1,000,000 per occurrence
OR	
Combined Single Limit	- $1,000,000 per occurrence
OR	
BI & PD per Occurrence	- $1,000,000
General Aggregate & Product Aggregate	- $2,000,000 each

- Coverage shall include: contractual liability (with this License, and any associated verbal agreements, being included under the definition of "insured Contract" there under), products/completed operations, and if applicable, explosion, collapse and underground (XC&U).
- If the products-completed operations coverage is written on a claims-made basis, coverage shall be maintained continuously for the duration of this License and for at least two years thereafter.
- National Grid USA and its subsidiaries, including its officers and employees, shall be included as an additional insured for all CGL coverages.
- Coverage for sudden and accidental pollution liability - limited solely by the Insurance Services Organization Standard pollution exclusion, or its equivalent. A contractor's pollution liability policy can be used to fulfill this requirement.

3. **Automobile Liability,** covering all owned, non-owned and hired vehicles used in connection with the Permitted Uses to be performed by or on behalf of Licensee or its Invitees under or in connection with this License, including, without limitation, recreational vehicles, with **minimum** limits of:

Bodily Injury	- $1,000,000 per occurrence; 1,000,000 aggregate
Property Damage	- $1,000,000 per occurrence
OR	
Combined Single Limit	- $1,000,000 per occurrence

- Coverage for sudden and accidental pollution liability - limited solely by the Insurance Services Organization Standard pollution exclusion, or its equivalent).
- National Grid and its subsidiaries, including its officers and employees, shall be included as an additional insured with respect to liability associated with, or arising out of, all operations, work and services to be performed by or on behalf of Licensee under or in connection with this License.

4. **Umbrella liability or excess liability** coverage, with a **minimum** per occurrence limit of $4,000,000. National Grid and its subsidiaries, including its officers and employees, shall be included as an additional insured for liabilities associated with, or arising out of, all Permitted Uses to be performed by or on behalf of Licensee or its Invitees under this License. This coverage shall run concurrent to the CGL required in section 2 above, and shall apply excess of the required automobile, CGL and employer's liability coverage required herein.

B. **Risk of Loss:** Licensee shall be responsible for all risk of loss to its equipment and materials, and any other equipment and materials owned by its employees if applicable, or by other third parties that may be in their care, custody and control.

C. **Sub-Contractors/subletting**: In the event Licensee uses contractors to perform any work activities on the right-of-way associated with this License, it is expressly agreed that Licensee shall have the sole responsibility to make certain that all contractors are in compliance with these insurance requirements, and remain in compliance throughout the course of this License, and thereafter as required. In the event Licensee sublets all or any portion of the Premises defined in this License, or assigns this License in accordance with its terms and conditions, Licensee shall require all subtenants or assignees provide the same insurance coverage as required in this insurance article.

In the event any sub-contractor is unable to maintain all of the same insurance coverage as required in this insurance article, Licensee agrees to indemnify and hold National Grid harmless against any and all liability resulting from any deficiency in sub-contractor's insurance coverage that may be out of compliance with these insurance requirements.

D. **Insurance Certification:** Prior to starting work, Licensee shall promptly provide National Grid with (a) **Certificate(s) of Insurance** for all coverage's required herein at the following address:

National Grid
Real Estate, DG
300 Erie Boulevard West
Syracuse, NY 13202
Attn: Real Estate Department, DG

Such certificates, and any renewals or extensions thereof, shall outline the amount of deductibles or self-insured retentions which shall be for the account of Licensee. Such deductibles or self-insured retentions shall not exceed $100,000 unless agreed to in writing by the Risk Management Department of National Grid, whose approval shall not be unreasonably withheld, delayed or conditioned.

Licensee shall provide National Grid with at least 30 days prior written notice of any cancellation or diminution of the insurance coverage required in this insurance article.

E. **Insurance Obligation:** If any insurance coverage is not secured, maintained or is cancelled before final termination of this License, or the completion of all obligations provided for under this License, whichever is later, and Licensee fails immediately to procure other insurance as specified, National Grid has the right, but not the obligation, to procure such insurance and to invoice Licensee for said coverage.

F. **Incident Reports:** Licensee shall furnish the Risk Management department of National Grid with copies of any accident or incident report(s) sent to Licensee's insurance carriers covering

accidents, incidents or events occurring on the property as defined within this License. In addition, if requested, Licensee shall promptly provide copies of all insurance policies relevant to this accident or incident.

G. **Other Coverage**: Licensee shall comply with any governmental and/or site specific insurance requirements, even if not stated herein.

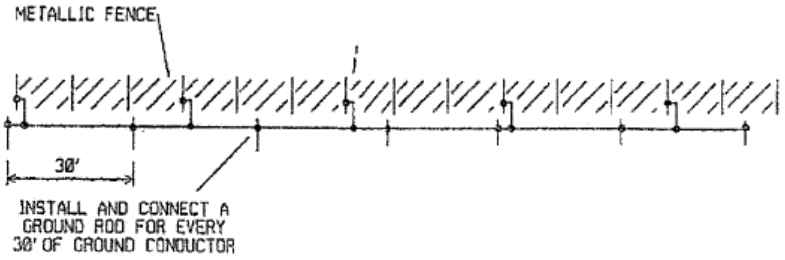
H. **Coverage Representation:** Licensee represents that it has full policy limits available and shall notify provide National Grid's Risk Management Department in writing when the minimum coverage's required in this article herein have been reduced as a result of claims payments, expenses, or both. However, this obligation does not apply to any claims that would be handled solely with in Licensee's deductible or self-insured retention.

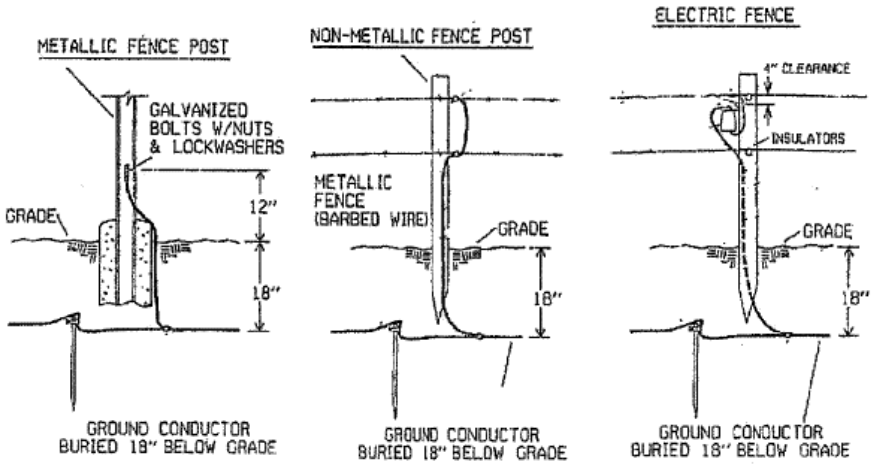
I. **Coverage Limitation**: Nothing contained in this article is to be construed as limiting the extent of the Licensee's responsibility for payment of damages resulting from all operations, work and services to be performed by or on behalf of Licensee under or in connection with this License, or limiting, diminishing, or waiving Licensee's obligation to indemnify, defend, and save harmless National Grid in accordance with this License.

MINIMUM GROUNDING SPECIFICATIONS FOR FENCES

Metallic fences that have the potential to be crossed by electric lines shall be grounded from the location that the supply line could cross the fence to the edge of the right-of-way on both sides. A grounding conductor must be buried below the fence line and bonded to the metallic posts. If the fence posts are nonconducting material, the ground conductor must be bonded to the metallic fence. This includes separate barbed wire strands if used.

Ground rods shall be installed at approximately 30 foot intervals along the buried grounding conductor. The grounding conductor should be bonded to the fence at every third fence post, or at 30 foot intervals, whichever distance is least.





SEP 1994 FENCE GROUNDING DETAILS 10-1067

SECTION 31210
EXCAVATION AND MANAGEMENT OF PCB IMPACTED MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The materials covered by this specification are soils and waste materials that contain elevated levels PCBs (greater than 50 parts per million), and potentially contain elevated levels of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and heavy metals.

B. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the excavation, handling, management, and off-site disposal of impacted materials as shown on the Drawings, and as herein specified.

1.2 REFERENCES

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. Occupational Safety and Health Act Regulations, 29 CFR 1910 and 1926.

b. Toxic Substance Control Act (TSCA) and 40 CFR 761.

c. 6 NYCRR Parts 360 & 364.

1.3 SUBMITTALS

A. Site-Specific Health and Safety Plan: Develop a written site-specific Health and Safety Plan (HASP) prior to commencing any on-site work and continue to implement, maintain, and enforce the plan until final demobilization from the site, in accordance with Section "Health & Safety Program". The development, implementation and maintenance of the HASP is the Contractor's responsibility.

B. Analytical Test Results: The testing laboratory shall submit written reports of all tests and analytical results to the Contractor and the Engineer.

C. Disposal Facility: Provide facility name, address, contact person, signed letter of agreement from the facility of intent to accept the waste as specified in the Contract, a listing of all permits, licenses, and letters of approval authorizing the disposal of wastes of this description at the designated facility as they pertain to this Contract. Additionally, the Contractor shall submit all waste profiles to the Engineer for review prior to commencing off-site disposal of the material. The Owner may direct that waste profiles be prepared and obtained by the Engineer.

D. Hauling of Material: For off-site disposal involving movement through an active lane of a public roadway, provide identification of and information of the proposed waste transporter, including the following minimum information: Hauler(s) name, address, contact person, EPA and NYS Transporter Identification Number, and any and all necessary permit authorizations for waste to be transported from the site to treatment/storage/disposal facilities. (Note: Any soil moved off-site or transported through an active lane of a public ready must be in NYSDEC Part 364 permitted vehicles and all loads must be properly covered and secured. Any federally required permits shall also be obtained by the Contractor prior to commencing with hauling activities.)

E. Disposal documentation: Within two (2) weeks of off-site disposal, the Contractor shall submit weight tickets and fully-executed manifests to the Engineer. The waste manifest ID number shall be placed on

all weight tickets so that they can be correlated with the waste manifests. All documents shall be submitted in a collated/organized fashion to the Engineer along with a summary sheet documenting the number of loads of material and the overall tonnage of material disposed.

F. Confirmatory Sample Results: Confirmatory soil samples will be collected from removal areas of the project site only as directed by the Engineer. Results shall be submitted to the Engineer upon receipt.

G. Notifications:

1. At least five (5) working days prior to beginning the work, provide the Engineer with the anticipated schedule of dates and work locations for the collection of the characterization samples if not already completed by the Engineer.

2. The Engineer and New York State Department of Environmental Conservation (NYSDEC) shall be provided a minimum of five (5) working days of notification prior to excavating or transporting any materials off-site for disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish all materials required by the Contractor's approved Materials Handling Plan. At a minimum furnish:

1. 10 mil plastic sheeting for covering the face of excavations not complete at the end each work day.

2. Waterproof tarpaulins for covering of trucks/roll-offs and waterproof liners as required.

3. Barricades and signage for excavation areas and work zones.

2.2 EQUIPMENT

A. Furnish all heavy equipment required by the Contractor to excavate, load, and haul waste materials. Provide dewatering equipment as necessary.

PART 3 - EXECUTION

3.1 PREPARATION

A. All excavations, including those to facilitate the collection of analytical samples, shall be completed in accordance with the requirements of Section "Earthwork" and Section "Waste Excavation and Relocation."

3.2 PRE-EXCAVATION CHARACTERIZATION

A. If completed by contractor personnel, sampling shall be conducted by a person thoroughly trained in sampling protocols using standard accepted sampling practices that are representative of the each area identified on the Drawings.

B. Collect representative composite samples of the soil from each of the potentially contaminated piles or lots, (separate samples for each pile category) from a depth of greater than one foot within each area

identified. Include, at a minimum, four sample points for each composite sample and homogenize before placing into laboratory containers. If required by the disposal facility, the contractor shall collect one composite sample for every 500 cubic yards of material disposed. An alternate sampling frequency may be allowed by the disposal facility. Grab samples shall be collected for all samples for VOC analysis.

SECTION 31220
DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes furnishing, installing, and maintaining a dewatering system to continuously lower and control groundwater levels and hydrostatic pressures in order to maintain near-dry conditions for construction of the work as shown on the plans and specified herein.

1.2 SUBMITTALS

A. Description: of proposed dewatering system.

B. Layout: of dewatering system, including location of sumps, deep wells, well points, header pipes, pumps, discharge lines and observation wells.

C. Details: of dewatering system, including installation methods for deep wells, well points and observation wells, depths of wells, material descriptions, pipe sizes, intake screen sizes, and pump capacities.

D. Estimate of time required to lower groundwater levels after start of pumping

1.3 JOB CONDITIONS

A. Site soil boring data and samples, soil laboratory testing, and any soil reports shall be made available to prospective bidders for study and review. Bidders must make their own interpretation of subsurface conditions that may affect methods or the cost of construction of the Work.

PART 2 - PRODUCTS

2.1 DEWATERING SYSTEM

A. Provide a dewatering system of adequate size and capacity to lower and maintain the groundwater at the specified level. The system shall include standby pumps and power source for continuous operation.

1. Dewatering system shall consist of wellpoints, deep wells, cut-off walls, riser pipes, swing joints, header lines, valves, pumps, discharge lines, and all other necessary fittings, accessories and equipment for a complete operating system. Provide hole punches, sand backfill and clay plugs as required by soil conditions.

B. Observation Wellpoints: Provide groundwater reading wells or piezometers to monitor the groundwater level, as indicated on the approved Shop Drawings or as directed by the Engineer.

C. Sand: Clean concrete sand conforming to ASTM C 33.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install the observation well points at locations indicated on approved Shop Drawings or where directed by the Engineer. Install observation wellpoints in accordance with manufacturer's printed instructions and in accordance with approved Shop Drawings. Provide sand backfill around wellpoint. Test each observation wellpoint to verify that the installation is performing properly.

B. Protect observation well standpipes from damage by construction operations and maintain accessibility to them. Maintain reading wells until groundwater is allowed to return to its normal level.

3.2 INSTALLATION

A. Install the dewatering system in accordance with approved Shop Drawings and as required by site conditions. Locate elements of the system to allow a continuous dewatering operation without interfering with the installation of any permanent project Work.

3.3 OPERATION

A. Keep the system in continuous operation from the time excavation is started in the dewatering area (or before if required by site conditions to lower the groundwater to the elevations specified) until the time backfilling is completed at least 2 feet above the normal groundwater level.

1. Do not discontinue dewatering operations without specific approval from the Engineer.

2. Rates of groundwater withdrawal during dewatering operations, shall at all times be below the rate at which soil particles are removed from the existing soils.

B. In the event excavation proceeds subsequent to dewatering as specified above, and the groundwater level is found to be within two feet of the excavation, the dewatering Contractor shall immediately continue to dewater as specified herein, including, but not limited to, additional dewatering and monitoring facilities, at no additional cost to the Owner. The excavation shall not be allowed to proceed below groundwater.

3.4 FIELD CONTROL

A. Maintain a careful check to detect any settlement in existing adjacent Work. Notify the Engineer of any signs of settlement. Establish settlement point bench marks and take periodic readings as directed. The Contractor shall take all such precautions and do any and all work necessary to protect the stability and integrity of adjacent lands, pavements, buildings and utilities from settlement or other movement that may be caused by his dewatering operations. The Contractor shall be solely responsible for any damage or injury to adjacent lands, pavements, buildings, or utilities caused by his dewatering or other operations or his failure to use corrective or preventive procedures or methods.

B. Take and record measurements of the groundwater in each reading and pumping well periodically and when directed by the Engineer.

3.5 DISCHARGE

A. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the Work under construction or completed.

B. Dispose of water in such a manner as to cause no inconvenience to others on or adjacent to the site.

C. Convey water from the excavation in a closed conduit. Do not use trench excavations as temporary drainage ditches.

D. Disposal of water shall be approved by the Engineer and shall not cause erosion or sedimentation to occur. All sedimentation or blocking of existing systems shall be thoroughly cleaned and returned to original condition by the Contractor, at his expense.

E. Discharge shall not be conveyed into water courses.

F. Discharge may be recirculated onto other parts of the landfill.

3.6 REMOVAL

A. When system is no longer required, gradually decrease the pumping rate until the water table resumes its natural position so that the velocity of the returning groundwater will be low enough as not to carry fines.

B. When the dewatering system is no longer required and when directed by the Engineer, dismantle and remove the system and all appurtenances from the site.

END OF SECTION

SECTION 31230
TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the excavation of trenching, backfilling, compacting, dewatering, excavation support and disposal, as shown on the Contract Drawings, and as herein specified.

B. The Engineer will determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. "Standard Specifications, Construction and Materials, New York State Department of Transportation, Office of Engineering."

b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

c. American Society for Testing and Materials (ASTM).

d. National Electric Code(NEC)

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control and other requirements of governmental authorities having jurisdiction, including the State.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications, in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. Samples:

1. The Contractor shall furnish representative earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.

B. Test Results:

1. The testing laboratory shall submit written reports of all tests, investigations, findings and recommendations to the Contractor and the Engineer.

1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protect excavations by shoring, bracing, sheet piling, or by other methods, as required to ensure the stability of the excavation. Comply with OSHA requirements.

C. Underpin or otherwise support structures adjacent to the excavation which may be damaged by the excavation. This includes service lines.

D. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Comply with OSHA requirements.

2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hours notice to the Owner and receive written notice to proceed before interrupting any utility.

E. Demolish and completely remove from the site any existing underground utilities designated to be removed, as shown on the Drawings or as specified.

F. Repair any damaged utilities as acceptable to the Owner, Engineer, and utility company at no additional cost to the Owner.

G. Contractor shall comply with maintenance and protection requirements as approved by the authority having jurisdiction.

H. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights, if required.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

4. Perform excavation within drip-line of trees to remain by hand, and protect the root system from damage or dry out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with burlap. Paint cut roots of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe Zone Bedding and Backfill: Sound, durable sand, gravel, stone or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of NYSDOT Section 304 and meeting the following gradation requirements (NYSDOT Subbase Type 4):

Sieve	Percent Passing
2"	100
¼”	30-65
No. 40	5-40
No. 200	0-10

B. Suitable Material: Sound, durable sand, gravel, stone or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of NYSDOT 203-2.02C and meeting the following gradation requirements:

Sieve	Percent Passing
4"	100
No. 40	0-70
No. 200	0-15

Run-of-trench material, meeting the above criteria, shall be considered suitable material and shall be used for trench backfill only after tested in accordance with Section "Quality Requirements" and approved by the Engineer. The Contractor shall pay for all additional testing required to determine the conformance of run-of-trench material, if at any time during the Work this material appears to be in non-conformance in the opinion of the Engineer.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. General:

1. Sufficient size samples shall be obtained from the potential borrow source to allow completion of tests listed in paragraph B below. Samples may be obtained from test borings, test pits, or from borrow pit faces provided that surficial dry or wet soil is removed to expose undisturbed earth. Tests listed below shall be performed on each sample obtained. A minimum of three (3) representative samples from each potential borrow source shall be furnished to the testing laboratory for prequalification testing. Test data shall be provided to the Engineer a minimum of 2 weeks prior to construction for approval of borrow source. Three test reports completed within three months prior to construction may be submitted for commercial earth borrow sources or suppliers of stone products (crushed stone or graded stone products) in lieu of prequalification tests as approved by the Engineer.

B. Material Tests:

1. Particle Size Analysis:

a. Method: ASTM D422

b. Number of Tests: One (1) per sample; three (3) per potential source.

c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:

a. Method: ASTM D1557 - Modified Proctor

b. Number of Tests: One (1) per sample; three (3) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

3.2 PREPARATION

A. Establish required lines, levels, contours and datum.

B. Maintain benchmarks and other elevation control points; re-establish if disturbed or destroyed, at no additional cost to the Owner.

C. Establish location and extent of existing utilities prior to commencement of excavation.

3.3 EXCAVATION

A. Excavation within National Grid/Niagara Mohawk easements shall comply with "Specifications for Proposed Activities Within NM/NG Easements and Rights-of-Ways included in Section "Waste Excavation".

B. All excavation shall be made to such depth as required and of the width shown on the Contract Drawings. Hand trench excavation may be required to protect existing utilities and structures.

C. Stockpile excavated subsoil for reuse where directed or approved.

D. Stability of Excavation: Slope sides of excavations shall comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavation in safe condition until completion of backfilling.

H. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.

3.4 DEWATERING

A The Contractor shall remove all water from the excavation promptly and continuously throughout the progress of the work and shall keep the excavation dry at all times until the work is completed and excavation is backfilled or have sufficient weight to resist uplift pressures. Groundwater levels shall be depressed to a minimum of 2 feet below excavation subgrade.

B. Provide a suitable point of discharge from dewatering operations. Water shall be conveyed in a non-erosive manner satisfactory to the Engineer.

C. Precautions shall be taken to protect uncompleted work from flooding during storms or from other causes. All pipe lines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected.

3.5 BEDDING AND BACKFILLING

A. All backfill shall be compacted by tamping or rolling to achieve a minimum dry density of 90 percent of the modified Proctor maximum dry density of the material used (ASTM D1557).. Backfill materials shall be placed with water content within plus or minus 4 percent of optimum moisture content per the standard Proctor method (ASTM D1557). Any water used for compaction shall be provided by the

Contractor at his own expense. The Contractor is responsible for the repair of any trench settlement at no expense to the owner.

3.6 BACKFILLING AROUND STRUCTURES

A. The Contractor shall not place backfill against any structure without obtaining the approval of the Engineer. No dumping shall be allowed where materials would flow against or around such structures. Backfill material shall be deposited in horizontal layers not exceeding 6 inches in loose thickness or as shown on the Contract Drawings and thoroughly compacted by hand or by mechanical means to the satisfaction of the Engineer.

3.7 SUSPENSION OF WORK

A. Whenever the work is suspended, excavations shall be protected and the roadways, if any, left unobstructed. Within or adjacent to private property, material shall be stored at such locations as will not unduly interfere with traffic of any nature and in no case shall materials be stored in locations which will cause damage to existing improvements.

3.8 DISPOSAL OF MATERIAL

A. Excess and unsuitable materials shall be disposed of by the Contractor on the site in an area approved by the Engineer or legally disposed of off- site at the Contractors expense.

3.9 FIELD QUALITY CONTROL

A. Notify the Engineer at least three (3) working days in advance of all phases of filling and Backfilling operations.

B. In-place density testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:

a. Method: AASHTO T238, Nuclear Method

C. Perform initial density testing to verify that contractors proposed compaction effort will obtain the minimum required densities.

D. In-place density tests on trench backfills shall be provided for every 500 cubic yards of fill and in vertical lifts not exceeding two (2) feet, and at least once daily.

E. One particle size analysis (ASTM D422) and one standard Proctor compaction test (ASTM D698) shall be competed for every 5,000 cubic yards of material placed.

F. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

G. Acceptance Criteria: The criteria for acceptability of in-place fill shall be in-situ dry density and moisture content. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION

SECTION 31240
EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.1 SUMMARY

A. This Section covers work necessary for stabilization of soil to prevent erosion and sedimentation during and after construction and land disturbing activities. The work shall include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified and as indicated on the Drawings. This shall include installation, maintenance, and final removal of all temporary soil erosion and sediment control measures. All erosion and sediment control methods and devices used shall conform to the latest requirements imposed by federal, state and local authorities.

B. Comply with SPDES General Permit GP-0-10-001 for stormwater discharges from construction activities and the Stormwater Pollution Prevention Plan prepared for the project. (Attached at the end of this Section.)

C. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. The right is reserved to modify the use, location, and quantities of soil erosion and sediment control measures based on activities of the Contractor and as the Engineer considers to be the best interest of the Owner.

D. The Contractor shall be responsible for repair of any damage caused and shall be financially responsible for any penalties imposed.

1.2 QUALITY ASSURANCE

A. Soil erosion and sediment control measures shall be implemented in accordance with the requirements and procedures outlined in this specification, contract Drawings and documents, state standards or guidelines for soil erosion and sediment control, and all regulatory authorities having jurisdiction. Where conflicts between requirements exist, the more restrictive rules shall govern.

B. The Contractor shall provide all temporary control measures shown on the Drawings, or as directed by the Owner, Owner's representative, or soil conservation district for the duration of the contract. Erosion and sediment control Drawings are intended to be a guide to address the stages of work shown. Additional measures not specified on the Drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to the Owner.

C. Temporary control provisions shall be coordinated with permanent erosion control features to the extent practical to assure economical, effective and continuous erosion and sediment control throughout the construction and post-construction period.

D. Soil erosion and sediment control measures shall at all times be satisfactory to the Owner's Representative. Owner’s Representative will inform the Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 48 hours, the Owner's Representative may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for additional compensation nor for an extension of time to complete the work. Any complaints, fines, etc. relating to ineffective erosion control, shall be the sole responsibility of the Contractor.

E. The Contractor shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance

of all soil erosion and sediment control measures on the project site shall be the responsibility of the Contractor until final stabilization is complete, and until the permanent soil erosion controls are established and in proper working condition.

F. The Contractor shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

1.3 GENERAL

A. Soil erosion stabilization and sediment control measures consist of the following elements:

1. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary.

2. Installation and maintenance of stabilized construction entrance(s)

3. Construction of new permanent and temporary storm drainage piping and channel systems, as necessary.

4. Construction of temporary erosion control facilities such as silt fences, check dams, etc.

5. Topsoil and Seeding: Placement and maintenance of Temporary Seeding on all areas disturbed by construction. Placement of permanent topsoil, fertilizer, and seed, etc., in all areas not occupied by structures or pavement, unless shown otherwise.

6. Soil Stabilization Seeding: Placement of fertilizer and seed, etc., in areas as Specified hereinafter.

B. The Contractor shall he responsible for phasing Work in areas allocated for his exclusive use during this Project, including any proposed stockpile areas, to restrict sediment transport. This will include installation of any temporary erosion control devices, ditches, or other facilities.

C. The areas set aside for the Contractor's use during the Project may be temporarily developed to provide satisfactory working, staging, and administrative areas for his exclusive use. Preparation of these areas shall be in accordance with other requirements contained within these Specifications and shall he done in a manner to both control all sediment transport away from the area.

D. Stockpiles remaining in place longer than 14 calendar days shall be considered permanent stockpiles for purposes of erosion and sediment control.

E. All permanent stockpiles shall be seeded with soil stabilization seed and protected by construction of silt fences completely surrounding stockpiles and located within 10 feet of' the toes of the stockpile slopes.

F. Sediment transport and erosion from working stockpiles shall be controlled and restricted from moving beyond the immediate stockpile area by construction of temporary toe-of-slope ditches and accompanying silt fences as necessary. The Contractor shall keep these temporary facilities in operational condition by regular cleaning, re-grading, and maintenance.

G. The Contractor shall maintain all elements of the Soil Erosion Stabilization and Sedimentation Control systems and facilities to be constructed during this Project for the duration of his activities on this Project.

H. Formal inspections made jointly by the Contractor and the Engineer shall be conducted every 2 weeks to evaluate the Contractor's conformance to the requirements of these Specifications.

I. Replacement or repair of failed or overloaded silt fences, check dams, or other temporary erosion control devices shall be accomplished by the Contractor within 24 hours after receiving written notice from the Engineer.

J. If the Contractor has not complied with any of the above maintenance efforts to the satisfaction of the Engineer within 2 working days after receiving written notification from the Engineer, the Owner shall have the prerogative of engaging others to perform any needed maintenance or cleanup, including removal of accumulated sediment at constructed erosion control facilities, and deduct from the Contractor's monthly partial payment the costs for such efforts in accordance with the General Condition of the Contract.

1.4 SUBMITTALS

A. Submittals shall he made in accordance with Section "Submittal Procedures"

B. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

C. Results of all tests and investigations, including recommendations.

D. Submit product data, samples, specifications and manufacturer's installation procedures for approval as directed by Engineer prior to use.

PART 2 – PRODUCTS

2.1 GENERAL

A. Contractor shall provide all materials necessary to perform the work in accordance with the SWPPP or as shown on the Drawings or specified herein.

2.2 PERMANENT SEED

A. Refer to Section "Turf and Grasses".

2.3 SOIL STABILIZATION AND TEMPORARY SEED

A. Temporary Seed: Rye grass, cereal grasses or other quick growing species suitable to the area as a temporary cover, which will not compete with the grasses specified for permanent cover, or as specified in the SWPPP or on the Drawings.

2.4 TOPSOIL

A. Topsoil shall be as specified under Section "Soil Preparation".

2.5 FERTILIZER

A. Refer to Section "Turf and Grasses".

2.6 LIME

A. Ground dolomite limestone not less than 85 percent total carbonates and magnesium, ground so that 50 percent passes through a No.100 mesh sieve and 90 percent passes a No.20-mesh sieve. Coarser material will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing the No.100-mesh sieve.

2.7 STRAW MULCH

A. Threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds or clean salt hay.

2.8 EROSION CONTROL BLANKET

A. Erosion Control Blanket (ECB) shall be constructed with a layer of 70% straw and 30% coconut fiber stitched with degradable thread between a heavyweight UV stabilized polypropylene top net (3.0 lb) and a lightweight photodegradable polypropylene bottom net (1.50 lb.). Both the netting and fiber material shall be green in color. Acceptable products shall include SC150 Double Net Straw-Coconut Blanket as manufactured by North American Green; Curlex Double Net (Curlex II) as manufactured by American Excelsior Company or an approved equal.

2.9 TURF REINFORCEMENT MATS

A. Permanent Synthetic Turf Reinforcement Mat (TRM) shall be constructed of UV stabilized polypropylene fiber (0.70 lbs/yd2) stitched with permanent polypropylene thread between heavyweight UV stabilized polypropylene top net (5.0 lbs/1000 ft2 approx. weight) and bottom net (3.0 lbs/1000 ft2 approx. weight). Both the netting and fiber material shall be green in color. Acceptable products shall include P300 Permanent Turf Reinforcement Mat as manufactured by North American Green; Recyclex TRM by American Excelsior Company or an approved equal.

2.10 STRAW BALE

A. Bales shall be tightly bound, staked with 1 inch by 1 inch hardwood stakes. Straw shall be from mowings of acceptable herbacceous growth free from noxious weeds.

2.11 STONE CHECK DAM

A. The gradation of stone check dam material identified on the plans shall meet the following requirements:

NCSA Rock Size*	Percent Passing by Weight
12”	100
6”	15-50
3”	0-15

*National Crushed Stone Association

B. Geotextile fabric for stone check dam shall meet the requirements non-woven fabric found in Section “Geotextiles.”

2.12 SILT FENCE

A. Silt Fence (SF) shall consist of woven geotextile fabric, posts, wire mesh backing, and fasteners meeting the requirements shown on the plan detail.

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall comply with and implement the Stormwater Pollution Plan provided in the contract documents.

B. Review the soil erosion and sediment control Drawings as they apply to current conditions. Any deviation from the Drawings must be submitted for approval to the site Engineer in writing at least 72 hours prior to commencing that work.

C. Initial soil sediment and erosion control devices shall be in place prior to any land disturbing activity, in their proper sequence, and maintained until permanent protection is established.

D. The limit of the area of any earthwork operations in progress shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such permanent control measures current and in accordance with the accepted schedule for construction phasing. Should seasonal limitations make such coordination unrealistic, as determined by the Owner's Representative, temporary erosion control measures shall be provided immediately by the Contractor at no expense of the Owner.

E. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

F. The Contractor shall incorporate all permanent erosion control features (stabilization) into the project at the earliest practical time to minimize the need for temporary controls.

G. A stabilized construction entrance (SCE) shall be installed and maintained at any point where construction vehicles enter a public right-to-way, street or parking area. The SCE shall be used to eliminate mud from the construction area onto public right-of-way. The SCE shall be constructed as shown on the Drawings. Any mud or debris tracked on streets shall be cleaned up immediately.

H. Dust Control: The Contractor shall provide a commercial grade; enclosed broom mechanical street sweeper to control sediment and/or dust that is tracked on to the adjacent streets. The street sweeper shall be equipped with a water storage tank to wet the area prior to sweeping. Where on site controls do not prevent material from being tracked on to adjacent streets, the street sweeper shall be used to clean the adjacent streets immediately. In addition, at a minimum, the adjacent streets shall be swept at the end of each day or as directed by the Engineer.

I. Any disturbed or stockpiled areas that will be left exposed more than 14 days or less according to State NPDES General Stormwater Permits shall immediately receive temporary or permanent seeding. Mulch/straw shall be used if the season prevents the establishment of a temporary cover. Disturbed areas shall be limed and fertilized prior to temporary seeding.

J. Permanent vegetation shall be established as specified on all exposed areas within 7 days or less according to State NPDES General Stormwater Permits after final grading. Mulch as necessary for seed protection and establishment. Lime and fertilize seedbed prior to permanent seeding.

K. Slopes shall be permanently seeded and mulched. Any slopes that erode easily shall be temporarily seeded and mulched. Any slopes deeper than 3:1 or steeper or as indicated on Drawings shall be protected with Erosion Control Blanket per specifications.

L. All storm drainage outlets must be stabilized, as specified, before the discharge points become operational. Equip all inlets with inlet protection immediately upon construction.

M. Discharge from dewatering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment through filtration and/or settlement. The Contractor shall obtain any required permits or confirm a permit is in place for dewatering activities.

N. Silt fence shall be installed at locations on the Drawings and any additional locations necessary for proper sediment control. The Contractor shall maintain the silt fence until the project is stabilized and shall remove and dispose of the silt fence and silt accumulation when 1/3 the height of the fence is reached.

O. Soil erosion and sediment control shall include but not be limited to the approved measures. The Contractor shall be responsible for providing all additional measures that may be necessary to accomplish the intent of the Drawings.

P. Comply with all other requirements of authorities having jurisdiction.

Q. Soil Stabilization and Temporary Seeding:

1. Soil stabilization seeding shall consist of the application of the following materials in quantities as further described herein for stockpiles and disturbed areas left inactive for more than 14 days.

   a. Lime.
   b. Fertilizer.
   c. Seed.
   d. Mulch.
   e. Maintenance.

2. Hydroseeding will be permitted as an alternative method of applying seed and associated soil conditioning agents described above. Should the Contractor elect to apply soil stabilization seeding by hydroseeding methods, he shall submit his operational plan and methods to the Engineer.

3. Temporary Seeding is to be placed and maintained over all disturbed areas prior to Permanent Seeding. Maintain Temporary Seeding until such time as areas are approved for Permanent Seeding. As a minimum, maintenance shall include the following:

a. Fix-up and reseeding of bare areas or re-disturbed areas.

b. Mowing for stands of grass or weeds exceeding 6 inches in height.

R. Topsoil and Permanent Seeding: conform to the requirements of Section “Soil Preparation” and “Turf and Grasses”.

END OF SECTION

SECTION 31350
COMPOSITE DRAINAGE NETTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. This Section includes installation of composite drainage netting consisting of geotextile heat bonded to both sides of high density polyethylene drainage netting.

B. All composite drainage netting shall be new, clean and in accordance with material specifications. In no instance shall second-hand or damaged materials be acceptable.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. American Society for Testing and Materials (ASTM).

B. Product Markings: Each roll shall be plainly and permanently marked with the following information:

1. Name or trademark of manufacturer

2. Date of manufacture

C. Qualifications: Installation Contractor including specific individuals who will participate in the installation project shall have demonstrated by previous experience their ability to do the work.

1.3 SUBMITTALS

A. Product Data:

1. Submit to the Engineer for approval manufacturer's catalog cuts, specifications and installation instructions.

B. Materials:

1. Submit to the Engineer for approval two (2) 1' x 1' samples of the composite drainage material prior to installation.

C. Layout Scheme:

1. Submit to the Engineer for approval a plan indicating the proposed panel layout.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver sufficient materials to the site to prevent interruption of the work.

2. All materials shall be inspected by Contractor upon delivery. Contractor shall notify Engineer of any damage. Damaged materials shall be removed from the site and replaced.

B. Storage:

1. The product shall be maintained in its protective wrapping until ready for use and stored to protect it from sunlight, heat, wind, and dust.

C. Handling:

1. The product and accessories shall be handled carefully with approved handling devices in strict conformance with the manufacturer's recommendations, as approved by the Engineer.

2. The product shall not be dropped or rolled off trucks, nor shall products be otherwise dragged, rolled or skidded.

3. The product shall be handled in such a manner as to prevent separation of individual components.

D. Products received at the site cracked, gouged, dented, ripped, separated, or otherwise damaged will not be approved and shall be returned and replaced at no expense to the Owner.

1.5 MATERIALS

A. The Contractor shall guarantee the composite drainage netting against defects in materials, fabrication, installation, and workmanship for 30 years commencing with the date of final acceptance.

PART 2 – PRODUCTS

A. Drainage Netting:

1. All drainage netting shall be high density polyethylene and exhibit the following properties:

Transmissivity per ASTM D-4716: 3.5×10^{-4} m2 /sec

B. Geotextile:

1. The fabric shall be heat bonded to both sides of the geonet and shall be Mirafi 140 N or equivalent nonwoven fabric having and EOS of greater than 100.

PART 3 – EXECUTION

3.1 HANDLING AND PLACEMENT

A. The Installer shall handle composite drainage netting in such a manner as to ensure it is not damaged in any way, and the following shall be complied with:

1. On slopes, the composite drainage netting shall be secured in a manner recommended by the manufacturer, acceptable to the Engineer, and then rolled down the slope in such a manner as to continually keep the composite drainage netting in tension. If necessary, the composite drainage netting shall be stretched by hand after unrolled to minimize wrinkles.

2. All composite drainage netting shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with cover material.

3. Unless otherwise specified, drainage netting shall not be welded to geomembrane.

4. The Contractor shall ensure that all necessary precautions are taken to prevent damage to the geosynthetic membrane and soil layers during placement of the composite drainage netting.

5. During placement of composite drainage netting, care shall be taken not to entrap dirt or excessive dust that could clog the drainage system, and/or stones that could damage adjacent geosynthetics.

6. Care shall be taken to remove tools from the surface of the composite drainage netting.

7. Composite drainage netting shall be anchored at the top of the slope as indicated in the Contract Drawings, or as recommended by the manufacturer and approved by the Engineer.

8. The upper edge of the composite drainage netting shall be wrapped with geotextile to prevent intrusion of soil particles.

B. The Composite drainage netting shall be placed on all slopes and shall extend over the cap surface as indicated on the Contract Drawings.

3.2 JOINING COMPOSITE DRAINAGE NETTING

A. Composite drainage netting shall always be laid in the same direction (i.e., composite drainage netting shall never be laid in perpendicular directions).

B. Adjacent composite drainage netting shall be joined according to the Contract Drawings and manufacturer's recommendations, as approved by the Engineer. As a minimum, the following requirements and procedures shall be met:

1. Peel back the upper filter fabric of adjacent rolls twelve (12) inches from the edges.

2. Overlap HDPE drainage netting by at least six (6) inches and secure with plastic ties.

3. Ties shall be every 5 feet along the slope and every 5 inches in the anchor trench.

4. Overlap the loose ends of the upper filter fabric of the adjacent rolls to create a complete seal over the HDPE netting.

5. The upper fabric layers shall be joined by tacking (sewing) at five (5) foot intervals along the seam.

6. In corners of the side slopes where overlaps between perpendicular geo-composite rolls are required, the adjacent rolls shall be cut as required to allow for a diagonal seam in the corner. Overlap shall be a minimum of one (1) foot for HDPE netting along diagonal seams.

3.3 GEOCOMPOSITE REPAIR

A. Any holes or tears in the composite drainage netting shall be repaired by placing a patch extending 2 feet beyond the edges of the hole or tear. The patch shall be secured to the original composite drainage netting by spot welding every 6 inches. If the hole or tear width across the roll is more than 50% the width of the roll, the damaged area shall be cut out and the two portions of the composite drainage netting shall be joined as indicated in the Joining section above.

3.4 COVER MATERIALS OVER COMPOSITE DRAINAGE NETTING

A. Granular materials shall be placed on composite drainage netting as shown on the Contract Drawings. During back dumping and spreading, a minimum depth of 6 inches of granular material shall be maintained at all times between the composite drainage netting and wheels of trucks or spreading equipment. All equipment used in spreading or traveling on the cover layer for any reason shall exert low ground pressures and shall be approved by the manufacturer and Engineer. Dozer blades, etc. shall not make direct contact with the composite drainage netting; however, if tears occur in the

composite drainage netting during the spreading operation, the granular material shall be cleared from the composite drainage netting and the damaged area repaired as previously described.

B. The granular material shall be spread in the direction of overlap. Special care shall be taken to maintain proper overlap and continuity.

C. All equipment spreading cover material or travelling on the cover layer shall avoid making sharp turns, quick stops or quick starts.

D. Composite drainage netting shall be covered as soon as possible after placement to minimize exposure to sunlight. Composite drainage netting shall not be exposed for more than 7 days.

3.5 DISPOSAL OF SCRAP MATERIAL

A. On completion of installation, the Contractor shall dispose of all trash and scrap material off-site or in a location approved by the Owner and Engineer, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner.

END OF SECTION

SECTION 31360
BARRIER PROTECTION LAYER

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the installation of the sand barrier protection layer as shown on the Contract Drawings and as specified herein.

B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.

C. The Engineer will determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. The latest edition of the following standards and regulations, as referenced herein, shall be applicable.

1. American Society for Testing and Materials (ASTM).

2. Standard Specification for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

3. 6 NYCRR Part 360 Solid Waste Management Facilities.

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control, and other requirements of governmental authorities having jurisdiction, including the State of New York.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils with the specifications, in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. The Contractor shall furnish representative earth materials to the testing laboratory for analysis and report, as directed by the Engineer or as outlined in the specifications.

B. Descriptive information on compaction equipment to be used for construction of the barrier layer, including equipment proposed for use in confined areas.

C. Plan detailing proposed borrow source, borrow source prequalification testing data, and estimated borrow source quantity.

D. Schedule of placement.

E. Test reports for prequalification and construction quality control/quality assurance testing shall be submitted to both the Contractor and Engineer.

1.4 PRODUCT HANDLING

A. Soil materials shall be excavated from the borrow source, transported, conditioned, placed, and stockpiled in such a manner so as to prevent contamination, segregation, and excessive wetting. Materials that have become contaminated, excessively wet, or segregated shall not be used and shall be removed from the site.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Selected Fill (for use in barrier protection layer): Sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the following gradation requirements:

Sieve	Percent Passing
1"	100
No. 40	30 – 70
No. 200	20 – 40

1. Particles retained on No. 4 sieve classified as subrounded to rounded.

2. Particle size analysis shall show no gap grading.

3. Shall have a Plasticity Index of at least 3.

4. Internal angle of soil friction shall be equal to or greater than 29° when compacted to 90% standard proctor maximum density.

5. Interface friction angle between barrier protection material and geo-synthetics shall be equal to or greater than 29° when compacted to 90% standard proctor minimum density.

PART 3 – EXECUTION

3.1 BORROW SOIL PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. General:

1. Sufficient size samples shall be obtained from the potential borrow source to allow completion of tests listed in paragraph B below. Samples may be obtained from test borings, test pits, or from borrow pit faces provided that surficial dry or wet soil is removed to expose undisturbed earth. Tests listed below shall be performed on each sample obtained. A minimum of three (3) representative samples from each potential borrow source shall be furnished to the testing laboratory for prequalification testing. Test data shall be provided to the Engineer a minimum of 2 weeks prior to start of barrier protection layer construction for approval of borrow source.

B. Material Tests:

1. Particle Size Analysis:

a. Method: ASTM D422

b. Number of Tests: One (1) per sample; three (3) per potential source.

c. Acceptance Criteria: Gradation within specified limits.

2. Atterberg Limits Determinations:

a. Method: ASTM D4318

b. BNumber of Tests: One (1) per sample; three (3) per potential source.

c. Acceptance Criteria: Plasticity index within specified limits.

3. Moisture Content:

a. Method: ASTM D2216

b. Number of Tests: One (1) per sample; three (3) per potential source. Test shall be performed on sample specimen preserved at natural (undisturbed) moisture condition.

4. Maximum Density Determination:

a. Method: ASTM D698 - Standard Proctor

b. Number of Tests: One (1) per sample, equaling three (3) per potential source.

5. Internal angle of soil friction and cohesion:

a. Method: ASTM 3080 - Direct shear test.

b. Number of Tests: One (1) test series per sample. Test series shall consist of three (3) identical specimens from each sample subjected to direct shear test using normal (vertical) stresses of approximately 1 pounds per square inch (psi), 2 psi and 4 psi. Test specimens shall be compacted to 90% of standard Proctor maximum dry density.

1.) Total number of specimens shear tested per sample: 3.

2.) Total number of specimens shear tested per potential borrow source: 9.

6. Interface Friction Angle:

a. Method: ASTM 3080 - Direct shear test with apparatus modified to test a minimum 12" by 12" (plan size) soil specimen and to firmly and uniformly hold geosynthetic material in place. Deformation of geosynthetic material shall not be permitted.

b. Number of Tests: One (1) test series per potential borrow source for each of the synthetic materials listed in paragraph 6-d below. Test series shall consist of three (3) identical specimens from one of the three borrow source samples subjected to direct shear test using normal (vertical) stresses of approximately 1 psi, 2 psi, and 4 psi. Test specimens shall be compacted to 90% of standard Proctor maximum dry density.

c. Acceptance Criteria: Friction angle greater than or equal to 29°. The purpose of the test is to verify design friction angles.

d. Synthetic to be used for interface shall be same type and manufacture used during construction.

1.) Geotextile filter fabric meeting specifications described in Section “Geotextiles.”

2.) Geomembrane materials meeting specification described in Section “Synthetic Geomembrane.”

3.) Composite drainage netting meeting specifications described in Section "Composite Drainage Netting."

3.2 PLACEMENT AND COMPACTION

A. General:

1. Remove or recompact any soft or loose soils as determined by the Engineer prior to filling. Particular emphasis shall be placed on obtaining a firm, compacted surface on the landfill side slopes.

2. Do not place fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water or extraneous debris.

3. When work is suspended during periods of freezing weather, measures shall be taken to prevent fill already in place from freezing. Upon resumption of work after any inclement weather, prepare the exposed surface by proof rolling to identify any zones of soft/loose soils. Soft/loose materials or frozen soils shall be removed and replaced.

4. The distribution of materials throughout the sand barrier protection layer shall be such that the layer will be free from lenses, pockets, streaks, and layers of materials differing substantially from the surrounding materials.

5. The placing of material shall be done so as to obtain a layer of uniform thickness without spaces between successively deposited loads.

6. Compaction of each layer shall proceed in a systematic, orderly, and continuous manner so as to ensure the specified coverages by the compaction equipment.

7. Materials which cannot be compacted by the approved rolling compaction equipment because of interferences shall be compacted with smaller approved compactors to a density at least equal to the density achieved in adjacent areas by the rolling compaction equipment and methods. Single pad vibratory base plate compactors shall weigh not less than 200 lbs. and have a vibration frequency not less than 1600 cycles per minute.

8. Should the fill surface become rutted or uneven subsequent to compaction, it shall be re-leveled and re-compacted before placing the next layer of material.

9. Fill on landfill side slopes shall be placed in lifts parallel with the sloping surface.

B. Barrier Protection Layer Placement and Compaction:

1. Place fill materials in layers not more than 10" in loose depth. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with 10" as a maximum lift height.

2. Moisture content of the material during compaction shall be between 3 percent dry and 3 percent wet of optimum moisture content as determined by ASTM D 698 (Standard Proctor).

3. All fill shall be thoroughly and satisfactorily compacted to at least 90 percent of the standard Proctor maximum dry density of the material used (ASTM D-698).

4. Where fill must be moisture conditioned before compaction, uniformly apply water to the surface of each layer of fill. Prevent ponding or other free water on the surface subsequent to, or during, compaction operations.

5. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to the specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

6. Rolling compaction equipment shall be heavy smooth drum in vibratory equipment capable of achieving the intended result. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics.

7. Compaction equipment shall make a minimum of 4 complete passes over the entire area of each lift.

8. The Contractor shall grade partially completed fill areas for drainage and thoroughly compact and smooth the surface at the end of each workday.

9. For areas not accessible to heavy rolling compaction equipment, fill materials shall be placed in horizontal layers not to exceed 6 inches in loose thickness and compacted with smaller rolling compaction equipment or hand operated equipment, as approved by the Engineer.

10. The final surface of the barrier layer shall be uniform and suitable for placement of the next subsequent layer.

3.3 FIELD QUALITY CONTROL

A. The Contractor's Testing Laboratory shall perform testing of sand barrier protection layer fill materials to insure compliance with these specifications in accordance with Section "Contractor Furnished Testing Laboratory Services."

B. In-place density and moisture content tests shall be performed on in- place fill material in accordance with ASTM D 1556, D 2167 or D 2922. In-place density shall be determined at a depth of 3 inches below grade. At least 9 tests shall be performed per acre per lift of material placed and at least one test shall be performed each day. Field test locations shall be subject to approval or relocation by the Engineer.

C. Tests for moisture content shall be performed on the in-place fill at a rate of nine tests per acre per lift. If nuclear methods or microwave methods are used to determine field moisture content, one oven-dry moisture content determination (ASTM D2216) shall be performed per acre per lift for calibration. Sample shall be obtained from a location immediately adjacent to an in-place density location.

D. One particle size analysis (ASTM D422) and one standard Proctor compaction test (ASTM D698) shall be completed for every 5,000 cubic yards of material placed.

E. The Engineer may direct additional tests to establish gradation, Atterberg limits, permeability, maximum density, in-place density, and water content as required by working conditions, or changes in borrow source material at the Contractor's expense.

F. Acceptance Criteria:

1. Acceptance Criteria: The criteria for acceptability of in-place fill shall be in situ dry density and moisture content. Minimum dry density for all fill shall be 90 percent of the standard Proctor

maximum dry density. The in-place moisture content shall be between 3 percent dry and 3 percent wet of optimum as determined by the standard Proctor compaction method (ASTM D-698). If a test fails to qualify, the fill shall be further reworked, compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

3.4 CLEAN UP

A. Provide and maintain protection of newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing if any.

B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.

C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION

SECTION 31370
STONE FILL

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes provisions for the placement of stone fill on embankment slopes, drainage courses, culvert inlets and outlets, and stream banks.

1.2 REFERENCES

A. "Standard Specifications, Construction and Materials, New York State Department of Transportation, Office of Engineering."

B. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

1.3 SUBMITTALS

A. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

B. Results of all tests, investigations, including recommendations.

C. Manufacturer's catalog cuts, production data, and recommended installation procedures for geotextile fabric.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stone fill shall conform with NYSDOT Section 620-2.02, and shall meet the following gradation requirements:

1. Fine

Stone Fill	Percent Passing by Weight
<8 inches	90 - 100
>3 inches	50 - 100
<#10 sieve	0 - 10

2. Light

Stone Fill	Percent Passing by Weight
<100 lbs	90 - 100
>6 inches	50 - 100
<1/2 inches	0 - 10

B. Bedding shall conform with NYSDOT Section 620-2.05, and shall meet the following gradation requirements:

Stone Fill	Percent Passing by Weight
4 inches	100
1 inch	15 – 60
¼ inch	0 - 25
No. 4	0 - 10

C. Geotextile: Shall conform to the requirements of Section "Geotextiles".

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Clear the surface on which any rip-rap is to be placed of brush, trees, or other objectionable material.

3.2 INSTALLATION

A. Geotextile Fabric: Shall be installed in conformance with the requirements of Section "Geotextiles."

B. Bedding

1. Place the bedding material on the geotextile to the full thickness, six (6) inch minimum, in one operation using methods that will not cause segregation of the aggregate.

2. Prevent contamination of bedding material by natural soils or other materials. Remove bedding materials that become contaminated and replace with uncontaminated bedding material.

3. Do not drop bedding material onto the geotextile from a height exceeding three (3) feet.

C. Stone Fill

1. Place the stones so that the dimension approximately equal to the layer thickness is perpendicular to the slope surface such that the weight of the stone is carried by the underlying material, not by the adjacent stones.

2. Place stone fill to minimize void spaces between adjacent stones.

3. On slopes the largest stones shall be placed at the bottom of the slope.

4. Place stone fill to avoid disruption and damage to the bedding material.

END OF SECTION

SECTION 32910
LANDFILL TOPSOIL

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the placement of topsoil in conformance with the lines, grades and thicknesses as shown on the Drawings and as herein specified.

B. Minimum thickness is six (6) inches, for all areas disturbed during construction and not receiving other surface treatment.

1.2 SUBMITTALS

A. Samples: The Contractor shall furnish earth materials to the testing laboratory for analysis and report, as directed by the Engineer or as outlined in the specifications.

B. Quality Control Submittals:

1. Test Reports: The testing laboratory shall submit written reports of all tests, investigations, and recommendations to the Contractor and the Engineer. The test results should include gradation, pH, organic content, U.S.D.A soil texture classification and chemical make-up.

2. Submit manufacturer's or vender's certified analysis for soil amendments.

1.3 QUALITY ASSURANCE

A. Reference Standards: The latest edition of the following standards, as referenced herein, shall be applicable.

1. "Standard Specifications, Construction and Materials, New York State Department of Transportation, Office of Engineering."

2. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

B. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils with the specifications, in accordance with Section 01400 "Quality Control Services."

1.4 PROJECT CONDITIONS

A. Coordinate the placement of topsoil with the completion all underground work including that of the other trades.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: Fertile, friable, natural non-contaminated loam free of subsoil, clay lumps, brush, stones, or other deleterious materials larger than two (2) inches in greatest dimension, meeting the following gradation requirements:

Sieve	Percent Passing
2"	100
1"	95 - 100
1/4"	70 - 95
No. 40	20 - 65
No. 200	10 - 20

1. pH range: 5.5 - 7.6

2. Organic Content: 5% - 25%

3. U.S.D.A Soil Texture: Sand loam, loam, clay loam, silt loam, or sandy clay loam.

B. The Contractor may amend natural topsoil or the Barrier Protection material with approved materials and by approved methods to meet the above specifications.

2.2 ACCESSORIES

A. Soil Amendments:

1. Soil amendments are not to be made without review and authorization by the Engineer.

2. Lime: Natural limestone containing not less than 85% of total carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve.

3. Aluminum Sulfate: Commercial grade.

4. Peat Humus: FS Q-P-166 and with texture and pH range suitable for intended use.

5. Bonemeal: Commercial, raw, finely ground; 4% nitrogen and 20% phosphoric acid.

6. Superphosphate: Soluble mixture of treated mixtures; 20% available phosphoric acid.

7. Sand: Clean, washed sand, free of toxic materials.

8. Perlite: Conforming to National Bureau of Standards PS 23.

9. Vermiculite: Horticultural grade, free of toxic substances.

10. Sawdust: Rotted sawdust, free of chips, stones, sticks, soil or toxic substances and with 7.5 lbs. nitrogen uniformly mixed into each cubic yard of sawdust.

11. Manure: Well rotted, unleached stable or cattle manure containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

12. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing available plant nutrients.

13. Commercial Compost: Containing no chemical or ingredients harmful to plants.

2.3 MATERIAL ACCEPTANCE

A. Topsoil may be acquired from approved sites that are designated on the Drawings or in the Proposal. If no sites are designated, material proposed for use as topsoil must be stockpiled, sampled, and tested prior to use.

B. Topsoil containing foreign or contaminated material may be rejected on the basis of visual examination by the Engineer, prior to testing.

C. Acceptance of topsoil shall be based upon test results. Tested topsoil must be approved in writing by the Engineer before any material is used.

PART 3 - EXECUTION

3.1 STOCKPILING

A. Topsoil shall be stockpiled from on-site sources or provided from off-site sources and stockpiled if on-site quantities are deficient.

B. Stockpiles shall contain not less than 200 cu. yds. or the minimum required for the project.

C. Stockpiles shall have a height of at least 4 feet and shall be trimmed to uniform surfaces and slopes.

C. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded and put into an acceptable condition by seeding as directed by the Engineer.

3.2 PREPARATION

A. Place topsoil on compacted subgrade conforming to Section 02200 “Earthwork” only after subgrades have been accepted by the Engineer.

B. Subgrades shall conform to the specified lines and grades.

C. Scarify the subgrade parallel to the contours to permit sufficient bonding with the topsoil. Do not scarify to the extent that the subgrade stability or density is disrupted.

D. Mix approved soil amendments into 6" inches of topsoil at necessary rates, if necessary.

3.3 TOPSOILING

A. Place topsoil in areas where seeding is to be performed. Place a 6" minimum depth to the finished grade elevations as shown on the Drawings.

B. Fine grade topsoil to eliminate uneven areas and to ensure proper drainage. Maintain finished grade elevations required.

C. Remove all stones, roots, grass, weeds or other foreign matter while placing.

D. Lightly compact the topsoil to ensure its stability.

E. Topsoil in an unworkable condition due to excessive moisture, frost, or other conditions shall not be placed until it is suitable for placement.

3.4 CLEANING

A. Remove all surplus subsoil and topsoil from project site.

B. Leave the site in clean, satisfactory condition ready to receive subsequent operations.

END OF SECTION

SECTION 32920
LANDFILL SEEDING

PART 1 – GENERAL

1.1 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and services necessary for, and incidental to, preparation of ground surfaces, fertilizing, seeding, mulching, and maintenance of seeded areas as shown on the Drawings or as specified herein.

B. Seed shall be sown from April 1st to June 1st or from September 1st to October 15th, unless otherwise approved by the Engineer.

1.2 SUBMITTALS

A. Quality Control Submittals:

1. Certification:

a. Submit manufacturer's or vendor's certified analysis for fertilizer materials.

b. Submit vendor's certified analysis for each grass seed mixture required, stating botanical and common name, percentages by weight, percentages by purity, germination , and weed seed.

2. Maintenance Instructions: Submit instructions recommending procedures to be established for maintenance of landscaped work for one (1) full year. Submit prior to expiration of Contractor's maintenance period.

3. Submit description of planned mulching techniques and corresponding manufacturer's installation recommendation for approval by the Engineer.

1.3 QUALITY ASSURANCE

A. All landscaping work shall be performed by one (1) Contractor, with proven experience in this field.

B. Package standard products with the manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of materials with the specifications, in accordance with Section 01400 "Quality Control Services."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fertilizer:

1. Commercial fertilizer (5-10-5) inorganic, or organic, containing not less than five (5) percent nitrogen, ten (10) percent available phosphoric acid, and five (5) percent water soluble potash.

2. If, as an alternative, the Contractor wishes to substitute for commercial fertilizer 5-10-5, another commercial fertilizer with a 1- 2-1 ratio, such as 10-20-10 or 6-12-6, he may do so with the approval of the Engineer and the rate of fertilizer to be used shall be whatever amount is required to furnish the same amount of nitrogen as would be supplied by the 5-10-5.

B. Seed:

1. Seed shall be fresh, clean, new-crop seed mixed in the proportions specified for species and variety, conforming to Federal and State Standards.

2. Use the following standard mixture, unless a special mixture is otherwise indicated or approved by the Engineer:

Species	% By Weight	% By Purity	% Germination
Creeping Red Fescue	40	95	85
Tall Fescue	30	95	85
Kentucky Bluegrass	15	95	85

3. Weed seed content shall not exceed 0.25%.

Species	% By Weight	% By Purity	% Germination
Perennial Rye	10	95	85
White Clover	5	80	80

C. Water: Clean, potable.

D. Mulch:

1. Provide and install a mulch adequate to protect the seeding during its growing period. It shall be the responsibility of the Contractor to determine the appropriate mulching techniques for the particular site conditions and acquire approval of the same from the Engineer.

2. Clean straw for gentle slopes, consisting of stalks of oats, wheat, rye, or other approved crops which are free of noxious weed seeds. Weight shall be based on a fifteen (15) percent moisture content.

3. Mulching blanket for steep slopes and drainage swales: “Curlex Blanket” by Amxco, “Ero- Mat” by Armco, or equal.

PART 3 - EXECUTION

3.1 PREPARATION OF TOPSOIL

A. Mix fertilizer into top 2 inches of topsoil at a rate of 20 lbs. per 1000 square feet.

B. Water dry topsoil to depth of 4 inches at least 48 hours prior to seeding to obtain a loose friable seed bed.

3.2 SEEDING

A. Apply seed only when wind velocities are less than five (5) miles per hour.

B. Sow half the seed with mechanical seeder.

C. Sow remaining half of seed at right angles to first seeding pattern, using the same method.

D. Apply seed at 5 lbs. per 1000 square feet.

E. Cover seed to a depth of 1/8 inch by raking, harrowing or cultipacking.

F. Roll seeded area with roller weighing no more than 150 lbs. per foot of roller width.

G. Water seeded areas to a depth of four (4) inches.

3.3 MULCHING

A. Spread straw uniformly over seeded area with 75% ground coverage and at least 1 1/2 inches loose depth.

1. If, in the opinion of the Engineer, wind will disrupt the mulching, apply asphalt emulsion at a rate of 10 gallons per 1000 square feet.

B. Place mulching blanket in accordance with submitted manufacturer's recommendations.

3.4 HYDROSEEDING

A. Mix specified seed, fertilizer and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

C. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate.

3.5 PROTECTION

A. Immediately after seeding and sodding, erect barricades and warnings to protect seeded areas from traffic until grass is established.

B. Repair or replace damaged landscape work as directed by Engineer.

3.6 MAINTENANCE

A. Begin maintenance immediately after seed placement.
B. Watering:

1. Keep soil moist during seed germination period.

2. Supplement rainfall to produce a total depth penetration of 2 inches per day after germination.

C. Mowing:

1. When grass reaches 4 inches in height, mow to 2-1/2 inches in height.

2. Maintain grass between 1-1/2 inches and 2-1/2 inches in height.

3. Do not cut off more than 40% of grass leaf in a single mowing.

4. Remove grass clippings.

D. Reseed and mulch spots larger than 1 square foot not having uniform coverage.

D. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-gardening and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

F. Maintain and protect all seeded areas until final acceptance of the Contract. Final acceptance of "Seeding: will not be made until an acceptable uniform stand of grass is obtained in all new lawn areas, except that the Engineer at his discretion may accept a portion or portions of the "Seeding" at various times. Upon acceptance by the Engineer of a seeded area, the Owner will immediately assume responsibility for maintenance and protection of that portion of the Contract Seeding.

END OF SECTION

SECTION 33000
CHAIN LINK FENCE AND GATES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the installation of chain link fence and gates, as shown on the Drawings and as specified herein.

B. All chain link fence and gates shall be thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire. Comply with ASTM F668, Class 2, not less than 10 mils (.010") thick. Color: Black.

1.2 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence and related gates as a complete system produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

C. Comply with ASTM A-120 for requirements of Schedule 40 piping.

D. Height of fence shall be measured from the top of concrete footing to the top of post.

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1.3 SUBMITTALS

A. Shop Drawings: Show application to project, include gates.

B. Product Data: Manufacturer's catalog cuts, with printed specifications, and installation instructions.

C. Samples: One sq. ft. minimum of fence fabric, and two of each size post tops and extension arms.

PART 2 - PRODUCTS

2.1 STEEL FRAME WORK

A. Nominal Framework Sizes shall be the following:

Fence Height	Line Posts	End, Corner & Pull Posts	Rails & Braces	Gate Frames	*Gate Posts	Concrete Foundation Dia.		Depth
						Diameters	Corner/End	
						Line Posts	Pull & Gate Posts	
8'	2"	2-1/2"	1-1/4"	1-1/2"	3-1/2"	12"	18"	4'

Schedule 40 S/L Pipe Table		
Nominal Size (In.)	Actual Outside Diameter (In.)	Weight *(lb/ft)
1	1.315	1.67
1-1/4	1.660	2.27
1-1/2	1.900	2.71
2	2.375	3.65
2-1/2	2.875	5.79
3	3.500	7.58
3-1/2	4.000	9.11

50,000 psi Hot Dipped Aluminized Steel Tubing		
Nominal Size (In.)	Actual Outside Diameter (In.)	Weight *(lb/ft)
1	1.315	
1-1/4	1.660	1.83
1-1/2	1.900	2.28
2	2.375	3.12
2-1/2	2.875	4.64
3	3.500	5.71
3-1/2	4.000	6.56

2.2 CHAIN LINK FABRIC

A. One-piece fabric widths.

B. Chain link, No.9 gauge, 2 inch mesh.

C. Selvages: Knuckled top and bottom.

D. Thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire. Comply with ASTM F668, Class 2, not less than 10 mils (.010") thick. Color: Black.

2.3 SWING GATE FRAMES

A.. Assemble gate frames by welding or with special steel fittings and rivets for rigid connections, as shown on the Drawings or on Shop Drawings approved by the Engineer.

B. Thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire. Comply with ASTM F668, Class 2, not less than 10 mils (.010") thick. Color: Black.

2.4 GATE HARDWARE

A. Hinges: Non-lift-off type, offset to permit 180 degree swing, and of suitable size and weight to
support gate. Provide 1-1/2 pair of hinges for each leaf over 6 feet high.

B. Latch: Provide plunger bar type complete with flush plate set in concrete for all double gates and single gates over 10 feet. Padlock eye shall be an integral part of latch construction.

C. Keeper for Vehicle Gates: Provide keeper which automatically engages the gate leaf and holds it in open position until manually released.

2.5 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Post Tops: Steel, wrought iron, or malleable iron, thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire. Comply with ASTM F668, Class 2, not less than 10 mils (.010") thick. Color: Black.

B. Stretcher Bars: One piece equal to full height of fabric, minimum cross-section 3/16 inch x 3/4 inch.

C. Metal Bands (for stretcher bars): Steel, wrought iron, or malleable iron, to secure stretcher bars to end, corner, pull and gate posts.

D. Wire Ties:

1. For tying fabric to line posts, rails and braces: 9 gauge steel wire.

2. For tying fabric to tension wire: 11 gauge steel hog rings.

E. Truss Rods: 3/8 inch diameter.

F. Tension Wire: 7 gauge coiled spring steel wire.

G. Angle Beams, I Beams and Steel Shapes: ASTM A-36.

H. Bolts and Nuts: ASTM A-307, Grade A.

2.6 FINISHES

A. Steel Framework:

1. Pipe: Galvanized in accordance with F1083, 1.8 oz. zinc per sq. ft.

2. Class "B" Steel Tubing: Exterior; 1.0 oz zinc per sq. ft. plus a coating of chromate and polyurethane. Interior; zinc rich organic coating.

3. Thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire. Comply with ASTM F668, Class 2, not less than 10 mils (.010") thick. Color: Black.

B. Fabric:

1. Thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire. Comply with ASTM F668, Class 2, not less than 10 mils (.010") thick. Color: Black.

C. Fence and Gate Hardware, Miscellaneous Materials, Accessories:

1. Wire Ties: Galvanized Finish, ASTM A-90 2.0 oz. zinc per sq. ft.

2. Hardware and Other Miscellaneous Items: Galvanized Finish, ASTM A-153 (Table 1).

3. Angle Beams, I Beams, and Steel Shapes: Galvanized in accordance with ASTM A-123, 2.0 oz zinc per sq. ft.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate fence and gate installation with completion of finished grading including topsoiling, and paving.

3.2 INSTALLATION

A. Space posts equidistant in the fence line with a maximum of 10 feet on center.

B. Earth: Excavate holes as indicated for fence and gate posts. Set posts in center of hole and fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish concrete in a dome shape above ground to shed water. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

C. Locate corner posts at corners and at changes in direction. Use pull posts at all abrupt changes in grade and at intervals no greater than 500 feet. On runs over 500 feet, space pull posts evenly between corner or end posts. On long curves, space pull posts so that the strain of the fence will not bend the line posts.

D. Install top rail continuously through post caps or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.

E. Install intermediate rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

F. Diagonally brace corner posts, pull posts, and terminal posts to adjacent line posts with truss rods and turnbuckles.

G. Attach fabric to security side of fence. Maintain a 1 inch clearance above finished grade except when indicated otherwise. Thread stretcher bars through fabric using one bar for each gate and end post and two for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches oc. Fasten fabric to steel framework with wire ties spaced 12 inches oc for line posts and 24 inches on center for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

H. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and score excess threads.

1. Secure post tops, extension arms, and caps with one-way cadmium plated steel screws.

I. Install gates plumb and level and adjust for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

J. Tension Wire: Support bottom edge of fabric with coil spring tension wire. Weave tension wire through fabric or fasten with hog rings spaced 24 inches oc. Tie tension wire to posts with 9 gauge wire ties.

END OF SECTION

SECTION 34000
SHEET PILING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the installation of sheet piling, as shown on the Drawings and as specified herein.

B. All sheet piling shall meet the service requirements along the north boundary of the North Landfill. The sheet piling shall stand as a vertical barrier along the north property line, penetrating one foot into the peat layer approximately 10 feet below ground surface. The south-facing surface of the sheet pile wall shall be flat to provide a seal surface for the landfill cap geomembrane. The top edge of the sheet pile wall shall provide anchorage for the new chain- link fence surrounding the landfill cap.

1.2 QUALITY ASSURANCE

A. Provide sheet piling as a complete system produced by a single manufacturer, including necessary erection accessories, fittings, and fastenings.

B. Installer's Qualifications: The firm performing the Work of this Section shall have been regularly engaged in pile work for a period of not less than 5 years and shall be properly equipped to execute the Work. If directed by the Engineer, furnish a list of projects of a similar type and magnitude executed by the firm.

C. Welders' Qualifications: Welding shall be performed only by welders, welding operators, and tackers who have been qualified by tests as prescribed in the AWS Code to perform the type of welding required.

D. Driving Equipment: Driving equipment shall match the selected sheet piling system and conform to the sheet piling manufacturer's specifications.

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1.3 SUBMITTALS

A. Shop Drawings: Contractor shall submit sheet piling system including sheet pile material, accessories, and sizing along with engineering calculations to indicate adequacy of sheet piling system for the application.

B. Product Data: Manufacturer's catalog cuts, with printed specifications, and installation instructions.

C. Samples: One sq. ft. minimum of sheet pile section if requested by Engineer.

PART 2 - PRODUCTS

2.1 SHEET PILES

A. Steel Piles: ASTM A 36, size and weight to meet the service requirements as shown on the Drawings and in this specification.

B. PVC/ Synthetic Piles: Size and weight to meet the service requirements as shown on the Drawings and in this specification.

C. Splices: To meet 100 percent of the strength of the pile.

D. Either a steel sheet pile or a PVC/synthetic sheet pile system shall be offered.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate sheet pile system installation with completion of finished grading including landfill cap termination, topsoiling, and fencing.

B. Verification of Conditions: Verify that site conditions will support driving equipment.

C. Notify the Engineer of intent to drive piles at least 5 working days before scheduled start of pile driving.

D. Do not drive piles until excavation work in that area has been completed down to the elevation of the bottom of the pile cap.

E. Provide temporary site improvement, such as grillage, as necessary to protect property and safely perform the Work.

G. Fit and install pile points as shown or in accordance with the reinforcing tip manufacturer's recommendations.

H. Measure piles and mark them with white paint. Indicate the overall length near top of pile. Mark the entire pile length at intervals as required by driving conditions or as directed. Measure and place graduated lines at closer intervals near top of pile

3.2 INSTALLATION

A. Except for making required splices, drive each pile continuously from the time it is started until it is completed unless unusual occurrences are encountered during driving.

B. Avoid damaging piles by over driving.

C. If piles are forced up by the driving of adjacent piles, or by any other cause, drive them down again as directed and without additional cost to the Owner.

D. Obstructions: If obstructions are encountered in the driving operation which cannot be displaced, break up or remove the obstructions to permit the unobstructed passage of the pile. If necessary, partially withdraw such a pile or remove it entirely as necessary to clear the obstruction and protect the pile from damage.

E. Splices: Splices are not allowed.

F. Cutting Off of Piles: Cut off top of piles at an elevation six inches above the finished grade. Make the cut perpendicular to the longitudinal axis of the pile unless otherwise indicated. If cut with a torch, remove slag.

G. Tolerances:

1. Variation From Plan Location: Center of pile at cutoff elevation shall be not more than 3 inches from its designed position.

2. Variation From Vertica: Pile shall be not more than 2 degrees from the vertical.

3. Variation From Cutoff Elevation: Top of pile shall be not more than 2 inches from its designed cutoff elevation.

3.3 FIELD QUALITY CONTROL

A. Driving Records: Obtain and record the data on the Driving Records and submit to Engineer.

3.4 REMOVING MATERIALS

A. Remove from site property cutoff lengths of piles and excess piles.

END OF SECTION