DIN 5316

Permit # 08-03

SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR

CONSTRUCTION OF CELL NO. 12
EAST CAROLINA REGIONAL MSW LANDFILL

BERTIE COUNTY, NORTH CAROLINA
REPUBLIC SERVICES OF NORTH CAROLINA, LLC

Rec'd
10-12-07
DJW

SEPTEMBER 2007

NORTH CAROLINA PROFESSIONAL SEAL 16146 ENGINEER WILLIAM F. HODGES

NORTH CAROLINA PROFESSIONAL SEAL No. 17423 ENGINEER HAROLD L. NEWBERRY

9/13/07

HODGES, HARBIN, NEWBERRY & TRIBBLE, INC.
CONSULTING ENGINEERS
484 MULBERRY STREET
SUITE 265
MACON, GEORGIA 31201

TEL: (478) 743-7175 FAX: (478) 743-1703

CONSTRUCTION OF CELL NO. 12

EAST CAROLINA REGIONAL MSW LANDFILL
BERTIE COUNTY, NORTH CAROLINA

REPUBLIC SERVICES OF NORTH CAROLINA, LLC

SEPTEMBER 2007

HHNT PROJECT NO. 6703-273-01

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CQA Manual

ADDENDUM NO. 1

SPECIFICATIONS AND CONTRACT DOCUMENT
FOR
CONSTRUCTION OF CELL NO. 12
EAST CAROLINA REGIONAL MSW LANDFILL
BERTIE COUNTY, NORTH CAROLINA

REPUBLIC SERVICES OF NORTH CAROLINA, LLC

OCTOBER 10, 2007

1. **SECTION I – INVITATION TO BID**

   The Bid Date has been changed. Faxed bids must be received by 2:00 p.m. on Friday, October 19, 2007, with a hard copy received by Noon on Monday, October 22, 2007.

2. **SECTION III – BID FORM**

   Replace with Section III – Bid Form (Revised October 10, 2007) (changes are in red).

3. **CLARIFICATIONS**

   a. **A Bid Bond is not required.**

   b. **Clearing debris may be burned provided required permits are obtained.**

   c. **Structural fill, clay and protective cover native soil shall come from the Tripp Property Borrow Area. The haul distance is approximately 3,000 feet. A report on the Tripp Borrow Area subsurface exploration is attached.**

   d. **GCL for the sump area will be provided by the Owner.**

   e. **Owner will provide power to the meter panel.**

   f. **The Contractor shall be responsible for maintaining the haul road to the Tripp Borrow Area such that it will be usable throughout the course of construction. The Contractor shall excavate structural fill, clay liner soil, and sandy protective cover soil in an orderly manner which does not co-mingle or mix remaining soils. To accomplish this, the Contractor shall provide a borrow management plan describing the sequence for material excavation storage and removal. At the conclusion of excavation, all exterior slopes shall be graded to 3:1 slopes and these shall be grassed.**

g. **A stockpile area and material laydown area will be provided within 500 feet of the cell.**

4. **ATTACHMENT**

Report of Subsurface Exploration, Soil Borrow Management Plan, Tripp Property, Construction of Cell No. 11 prepared by Bunnell-Lammons Engineering, Inc., dated July 17, 2005.

END OF ADDENDUM NO. 1

I

INVITATION TO BID

Sealed Bids for the **Construction of Cell No. 12** will be received at the offices of:

Hodges, Harbin, Newberry & Tribble, Inc.
484 Mulberry Street, Suite 265
Macon, Georgia 31201
Attention: Mr. Bill Hodges, P.E.

until 2:00 p.m., local legal prevailing time on: Monday, October 15, 2007 at which time and place they will be opened in private. Bidders may fax their bids with one copy to Hodges, Harbin, Newberry & Tribble, Inc. (478-743-1703). A copy of the bid bond **must** accompany the proposal. The faxed proposal will be accepted **if** a hard copy is received by 12:00 p.m. on Tuesday, October 16, 2007 at the office of Hodges, Harbin, Newberry & Tribble, Inc; 484 Mulberry Street, Suite 265, Macon, Georgia 31201; P.O. Box 974, Macon, Georgia 31202. No bid may be withdrawn for a period of sixty (60) calendar days after the closing time for the receipt of bids.

The work to be done consists of furnishing all materials and equipment and performing all labor necessary for the **Construction of Cell No. 12** and all incidental work required in connection therewith (the "Project"). All work must be performed in accordance with the Contract Documents. The work will be awarded in one (1) contract (the "Contract").

Additional Bidding Documents are on file and may be obtained from Hodges, Harbin, Newberry & Tribble, Inc., 484 Mulberry Street, Suite 265, Macon, Georgia 31201; P.O. Box 974, Macon, Georgia 31202, for a cost of $100.00 per NON-REFUNDABLE. For additional information, please contact Hal Newberry, P.E. or Bill Hodges, P.E. at (478) 743-7175. Bidders are required to use the printed forms contained in or referenced in the Contract Documents.

The Successful Bidder, if awarded the Contract, will be required to furnish a Performance Bond and a Payment Bond, each with corporate surety in an amount equal to one hundred percent (100%) of the Contract amount. The surety company on the Performance Bond shall be a surety company authorized to do business in the State in which the Project is located, and the surety company on each of the Performance Bond and the Payment Bond must appear on the Treasury Department's most current list (Circular 570), as amended. In any event, each such bond and surety company must be acceptable to OWNER and its counsel in all respects.

The Bidder must hold current utility contractor and other necessary licenses and approvals issued by all applicable licensing boards and authorities in the State in which the Project is located.

All Bids must be in accordance with the "Instructions to Bidders" attached, and all written amendments, if any, issued by OWNER. From the Bids received, OWNER may select one successful Bid. Alternatively, OWNER may choose to select a short list of Bidders to further discuss proposal details. Notwithstanding the foregoing, OWNER reserves the right, in its sole discretion and without qualification, to accept any Bid, to reject any or all Bids, to waive irregularities and informalities in process and Bids received, and to reject nonconforming, unresponsive, or conditional Bids, and any Bids determined not to be in the best interests of either or both of OWNER and the Project. The OWNER further reserves the right to change the scope of this project and thereby change the quantities in the Proposal by up to 50%. OWNER shall not have any obligation to the successful Bidder unless and until the Contract is executed between OWNER and such Bidder. Expenses associated with preparing a Bid and finalizing the Contract (if applicable) that are incurred by any party responding to this request shall be the sole responsibility of such responding party.

OWNER: Republic Services of North Carolina, LLC
Bill Cooksey, Site Manager

Dated: October 1, 2007

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

REPORT OF SUBSURFACE EXPLORATION

SOIL BORROW MANAGEMENT PLAN
TRIPP PROPERTY

CONSTRUCTION OF CELL NO. 11

EAST CAROLINA REGIONAL MSW LANDFILL
BERTIE COUNTY, NORTH CAROLINA

Prepared for:

Hodges, Harbin, Newberry, & Tribble, Inc.
Macon, Georgia

Prepared by:

Bunnell-Lammons Engineering, Inc.
Greenville, South Carolina

NORTH CAROLINA PROFESSIONAL SEAL No. 13814 ENGINEER DANIEL B. BUNNELL

July 17, 2005

BLE Project Number J05-1001-51

BLE INC.
BUNNELL-LAMMONS ENGINEERING, INC.
GEOTECHNICAL, ENVIRONMENTAL AND CONSTRUCTION MATERIALS CONSULTANTS

June 17, 2005

Republic Services of North Carolina, LLC
c/o Hodges, Harbin, Newberry & Tribble, Inc.
484 Mulberry Street
Suite 265
Macon, Georgia 31201

Attention: Mr. William F. Hodges, P.E.

Subject: **Report of Subsurface Exploration**
Soil Borrow Management Plan; Tripp Property
Construction of Cell No. 11
East Carolina Regional MSW Landfill
BLE Project No. J05-1001-51

Dear Mr. Hodges:

Bunnell-Lammons Engineering, Inc. (BLE) has performed a series of test pits and soil test borings in the potential future borrow area known as the "Tripp Property" at the East Carolina MSW Landfill in Bertie County, North Carolina. The purpose of this exploration was to gather information on the location and volume of a borrow source for potential native sandy soil protective cover, structural fill and compacted clay liner borrow and present a management plan for their use. Laboratory conformance testing to determine the suitability of the sampled soils for use in the protective cover layer and compacted clay liner in Cell No. 11 were performed. This report presents a summary of the laboratory testing of protective cover and compacted clay liner borrow soils and presents recommendations for their use.

PROJECT INFORMATION

The planned construction is to consist of the subgrade preparation, structural fill, clay liner, 60-mil HDPE geomembrane, protective cover, and leachate collection system for Cell No. 11. The construction is indicated on the project plans titled *Construction of Cell No. 11, East Carolina Regional MSW Landfill*, the specifications, and contract documents dated *May 2005*, and prepared by Hodges, Harbin, Newberry & Tribble, Inc. (HHNT). We have referenced testing requirements of *Protective Cover – On Liner – Native Sandy Soil* as detailed in project specifications and CQA Manual. The proposed Cell No. 11 at the East Carolina Regional MSW Landfill will be the ninth lined cell to be constructed. The lined portion of Cell No. 11 will occupy approximately 10 acres (435,600 sf) north of existing Cell No. 10. We understand that approximately 205,000 cy of structural fill will be required to reach design subgrade elevations.

The liner system will consist of a 24-inch thick compacted clay liner (approximately 32,500 cy) having a permeability (k) of less than or equal to 1×10^{-7} cm/s overlain by a minimum 60-mil HDPE geomembrane, a cushion geotextile, and a 24-inch thick protective cover / leachate collection layer (32,500 cy). The protective cover over the geomembrane will consist of a 24-inch thick layer of leachate collection sand (permeability $k \geq 1 \times 10^{-3}$ cm/s).

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29615

PHONE (864) 288-1265
FAX (864) 288-4430

The soil borrow for this project will be obtained from the Tripp Property. The approximate location is shown on the attached Figures 1 and 2. Excavation of the structural fill soils and clay liner should be planned so that the surface of protective cover soils is exposed to yield the required excavation volume. The location of the native sandy soil protective cover borrow within the Tripp Property borrow area will therefore influence where borrow soils for the clay liner and structural fill will be sourced. This report details recommendations for the soil management plan for the Tripp Property borrow area for the Cell No. 11 construction.

The topographic survey indicates that the current ground surface elevation in the borrow area is approximately 54 feet MSL with future borrow excavations to approximately 30 feet MSL. The borrow evaluation and soil management plan assumes that the excavation depths for Cell No. 11 borrow materials will extend to 30 feet MSL.

FIELD AND LABORATORY ACTIVITIES

Prior test pit excavations performed in the Tripp Property under the direction of BLE were initially reviewed. Test pit excavations, soil test borings, and laboratory testing were performed as part of the current exploration. The test pits were excavated using a track-mounted backhoe provided and operated by landfill personnel. The soil test borings were performed by an all-terrain-mounted drill rig using hollow stem augers in general accordance with ASTM D 1586. The test pits were used to evaluate the shallower potential structural fill and clay liner borrow soils and the soil test borings were used to evaluate the potential protective cover borrow soils. The test pit and soil test boring locations were selected and located in the field by BLE. The subsurface stratification at each test pit and soil test boring was recorded based on visual classification of the soils encountered. Representative samples of the soils were obtained for confirmation classification by our engineering staff and for performance of laboratory tests. Figure No. 3, attached to this report, shows the approximate locations of the test pits and soil test borings.

Geotechnical laboratory tests were performed on selected representative soils sampled from the test pits and borings to confirm the visual classifications. The borrow area laboratory testing program consisted of the following: grain size (ASTM D 422), Atterberg limits (ASTM D 4318), standard Proctor compaction (ASTM D 698) and remolded permeability (ASTM D 2434 & 5084) tests. The laboratory test results are attached.

TEST RESULTS AND EVALUATION

The subsurface conditions encountered in the test pits generally consisted of a topsoil layer approximately 3 to 9 inches thick underlain by layers of sandy silts and clays to varying depths (designated as Layer I site soils). In the western portion of the borrow area, the surface and near surface sandy silts and clayey silts extend to a typical depth of approximately 13 feet. From west to east, clay content in these upper Layer I soils increases beginning at TP-4 becoming silty sandy clay and sandy clayey silt at TP-5. These silty sandy clays and sandy clayey silts are present in intermittent layers to a typical depth of 9 feet from TP-5 extending to TP-13 on the east side of the explored area. Beneath the silty sandy clays and the sandy and clayey silts, a thin layer of silty fine sand with clay nodules is present overlying slightly silty fine and fine to medium sands (Layer II). These slightly silty fine and fine to medium sands range in thickness from

approximately 10 feet on the west side of the borrow area to 4 feet in the middle and 17 feet on the east side within the excavation depths indicated on the project drawings. The deeper borings were terminated in a layer of gray clayey silt (Layer III). Groundwater was encountered typically 6 to 8 feet below the ground surface.

Records of the subsurface conditions encountered at each test pit and boring are attached. The above descriptions provide a general summary of the subsurface conditions encountered. The Test Pit Logs and Boring Logs included in the appendix contain detailed information recorded at each respective location. The Test Pit Records and Boring Logs represent our interpretation of the field logs based on engineering examination of the field samples. The lines designating the interfaces between various strata represent approximate boundaries and the transition between strata may be gradual. It should be noted that the soil conditions vary between the test locations.

Structural Fill:

Soils in the western portion of the Tripp Property not to be suitable for use as either clay liner borrow having a permeability of $k \leq 1 \times 10^{-7}$ cm/s or protective cover sand having a permeability of $k \geq 1 \times 10^{-3}$ cm/s should be used as structural fill borrow. Higher permeability soils suitable for clay liner borrow soil are present in the middle portion of the borrow area and could be used as either structural fill borrow soil or clay liner borrow soil as the soil suitable for use as clay liner exceeds the volume required for Cell No. 11 construction.

The structural fill borrow in the western portion of the site exists under a layer of topsoil 3 to 9 inches thick and extends to approximately 13 feet below the ground surface. Between TP-4 and TP-5 the clay content in some of the layers in these upper soils increases and becomes suitable for use as either clay liner or structural fill borrow. The recommended initial structural fill borrow source is shown on the attached drawing (Figure 4) as Structural Fill Borrow Source I. This approximately 4-acre area located within the western portion of the borrow area could provide approximately 70,000 cy of the 205,000 cy in-place structural fill volume required to construct the cell. These soils are sandy clays, sandy silts and silty clayey sands. Potential protective cover sand underlies the structural fill borrow in this area and would then be exposed for later use in the cell construction.

The remaining needed 135,000 cy could be excavated from the transitional zone between the suitable clay liner borrow soil and underlying protective cover sand over the remaining portion of the borrow area and/or from the higher permeability clay liner borrow soils in the upper layers (approximately 1 to 4 feet below the ground surface) near TP-5 and TP-6. The transitional zone between the suitable clay liner borrow and the underlying protective cover borrow varies in thickness from one foot in TP-5 beginning at approximately 14 feet below the ground surface to 6 feet in TP-8 and TP-9 beginning at approximately 3 feet below the ground surface. Lower permeability soils are present to the east of the area labeled Structural Fill Borrow Source II and are suited for use as clay liner borrow soil. If all the soil above the protective cover sand borrow layer is excavated and used for structural fill, Structural Fill Borrow Source II could provide the additional needed 135,000 cy of structural fill required to reach design subgrade elevations. The excavation would result in the exposure of the protective cover sand needed for use in Cell No. 11 construction.

Compacted Clay Liner:

Grain size analyses and Atterberg limits testing were performed on soil samples taken from test pits in the borrow area (see attached Summary of Laboratory Testing) to assist in the classification and determination of potential use. Permeability testing was performed on potential clay liner borrow samples with percent fines contents ranging from 77 % to 81 % and plasticity indices ranging from 28 to 34. The remolded permeability tests on two representative samples achieved hydraulic conductivities of $k = 4.2 \times 10^{-8}$ cm/s in TP-5 in the representative zone from 4 feet to 13 feet below the ground surface and $k = 5.6 \times 10^{-8}$ cm/s for TP-6 in the representative zone from 1 feet to 9 feet below the ground surface. The required permeability (k) is $\leq 1 \times 10^{-7}$ cm/s.

Based on the field exploration and laboratory testing, the clayey and correspondingly low permeability soils represented by the samples taken at test pit nos. TP-5 and TP-6 are suited for use to construct a compacted clay liner having a permeability of $k \leq 1 \times 10^{-7}$ cm/s. These soils were encountered in the middle to eastern portion of the borrow area shown on the attached drawing (Figure 5). The soils suitable for the compacted clay liner borrow exist at the surface under approximately 1 to 4 feet of topsoil, silty sand, and sandy silt and extend to depths of approximately 6 to 13 feet. Visual inspection of the test pits and samples taken from the test pits indicates that the permeability of the suitable clay liner borrow soils is lower in the soils present in the eastern portion of the borrow area. Therefore, the soils in the eastern portion of the borrow area are more suited for use as clay liner borrow soil. It is estimated that approximately 39,000 cy of borrow soil will be required to construct the clay liner for the 10 acre Cell No. 11. This volume is based on a 24-inch thick clay liner including an allowance for spillage and shrinkage. The proposed clay liner borrow area could provide approximately 200,000 cy. Any low permeability soil used for structural fill borrow would reduce this total amount. A brief soil management excavation sequencing plan is presented in Recommendations portion of this report.

Protective Cover Sand:

Grain size and permeability testing were performed on sand samples taken from test pits and borings in the borrow area (see attached Summary of Laboratory Testing) to assist in the classification and determination of potential use. Percent fines contents ranging from 8.2 % to 13.3 % and achieved hydraulic conductivities ranging from $k = 1.2 \times 10^{-2}$ cm/s to $k = 3.2 \times 10^{-3}$ cm/s. The required permeability (k) is $\geq 1 \times 10^{-3}$ cm/s.

Based on the field exploration and laboratory testing, the sandy soils with percent fines contents of less than or equal to approximately 15% represented by the samples taken at boring and test pit nos. B-1 and 2 at 13.5 to 15 feet, B-6 at 13.5 to 15.5 feet, TP-6 at 14.25 to 17.5 feet, TP-7 at 14.75 to 17.5 feet, TP-11 at 10 feet are suited for use to construct a protective cover layer having a permeability of $k \geq 1 \times 10^{-3}$ cm/s. These sands were encountered beneath the structural fill borrow soils in the western portion of the borrow area beginning at approximately 13 feet extending to approximately 24 feet below the ground surface between TP-1 and TP-4. A thinner layer of suitable sands approximately 3 feet thick exists near TP-5, TP-6, TP-7 and B-3 and is underlain by gray clayey silt. From B-4 and east, the suitable sand layer increases in thickness from approximately 10 feet thick in B-4 at 10 to 20 feet below the ground surface to 17 feet thick in B-7 at 13 to 30 feet below the ground surface. The soils were found under suitable clay liner and structural fill borrow soils. Once encountered at the depths indicated, the coarseness and permeability of the sand increased with depth down to the gray clayey silt layer

9.0^{-4} 1.0^{-3} $\geq$ 8.0^{-3} 1.0^{-4}

assumed to underlie the entire borrow area based on similar subsurface conditions encountered in current and historical borings, test pits, and excavations throughout the East Carolina Landfill area.

It is estimated that approximately 39,000 cy of borrow soil will be required to construct the protective cover layer for the 10-acre Cell No. 11. The area located within the western portion of the borrow area designated on Figure No. 6 could provide approximately 30,000 cy. The remaining 9,000 cy could be excavated from the thinner layer of suitable sands approximately 3 feet thick that is present near TP-5, TP-6, TP-7 and B-3. A total of approximately 250,000 cy of protective cover borrow sand having a permeability of $k \geq 1 \times 10^{-3}$ cm/s is estimated to be present in the Tripp Property borrow area. A summary of our recommended soil management excavation sequencing plan is presented in Recommendations portion of this report.

RECOMMENDATIONS

Structural Fill Borrow Sources I & II: Structural fill borrow excavation should begin at the west side of the area labeled Structural Fill Borrow Source I in Figure 4. The excavation should advance east and continue through of Structural Fill Borrow Source II. Structural fill should be excavated to expose the underlying protective cover sand borrow, (slightly silty to silty fine to medium sand). The elevation of the top of the protective cover layer will remain fairly constant over Structural Fill Borrow Source I and vary from 9 to 15 feet below the ground surface in Structural Fill Borrow Source II.

It is estimated that approximately 205,000 cy of structural fill borrow soil will be required to reach design subgrade elevations in Cell No. 11. If all of the soils suitable for structural fill are excavated from Structural Fill Borrow Source I (70,000 cy) and Structural Fill Borrow Source II (150,000 cy), these two areas could provide enough structural fill borrow soil to reach design subgrade elevations in Cell No. 11.

Clay Liner Borrow Source: Clay liner borrow excavation should begin at the cut face of the Structural Fill Borrow Source II) excavation in the area labeled Clay Liner Borrow Source on the attached Figure 5. The soils suitable for the compacted clay liner borrow exist at the surface under approximately 1 to 2 feet of topsoil, silty sand, and sandy silt and extend to depths of approximately 6 to 13 feet to the east side of the borrow area. Clay liner borrow soils should be excavated to expose the underlying protective cover sand borrow (slightly silty to silty fine to medium sand).

Protective Cover Sand Borrow Source: The protective cover sand borrow source exists under the structural fill and clay liner borrow soil over the entire Tripp Property borrow area within the planned excavation depths. Protective cover sand borrow excavation should begin at the west side of the borrow area after the structural fill and clay liner borrow excavations have exposed to underlying sand and advance east. The soils suitable for the protective cover borrow were encountered beneath the structural fill borrow soils in the western portion of the borrow area beginning at approximately 13 feet extending to approximately 24 feet below the ground surface. A thinner layer of suitable sands approximately 3 feet thick exists in the middle portion of the borrow area and is underlain by gray clayey silt. In the eastern portion of the borrow area, suitable sand layer increases in thickness from approximately 10 to 17 feet thick. If excavations for the protective cover sand are performed to the depths indicated in the project drawings, a

sufficient amount of protective cover sand will be exposed during other borrow soil excavations to construct the protective cover layer for Cell No. 11.

The CQA technician should monitor the excavation of the borrow soils and assist in the delineation of suitable structural fill and clay liner. The CQA technician should also observe the borrow soil excavations down to the protective cover layer to monitor the continuing suitability of the exposed sands for use in the protective cover layer.

The groundwater level was encountered in the test pits at typical depths of 6 to 8 feet. Stabilized groundwater elevations in the excavation could be as high as elevation approximately 51 feet (3 feet below the general ground surface). Excavations into the deeper structural fill, clay and in particular, the protective cover sands, will require dewatering. This has been performed during previous excavations at the landfill by employing sump pumps and ditching. The dewatering should begin prior to and continue throughout excavation. Excavation side slopes of 2:1 or flatter should be used.

SUMMARY

In summary, we recommend that structural fill borrow first be excavated from Structural Fill Borrow Source I then Structural Fill Borrow Source II (Figure 4). Clay liner borrow should be excavated from the Clay Liner Borrow Source as shown in Figure 5. Exposed sands in these areas, as shown on Figure 6, should then be excavated for use in the protective cover layer.

Bunnell-Lammons Engineering is pleased to have the opportunity to be of continued assistance at the East Carolina Regional MSW Landfill. Please contact us if you have any questions concerning this letter.

Sincerely,

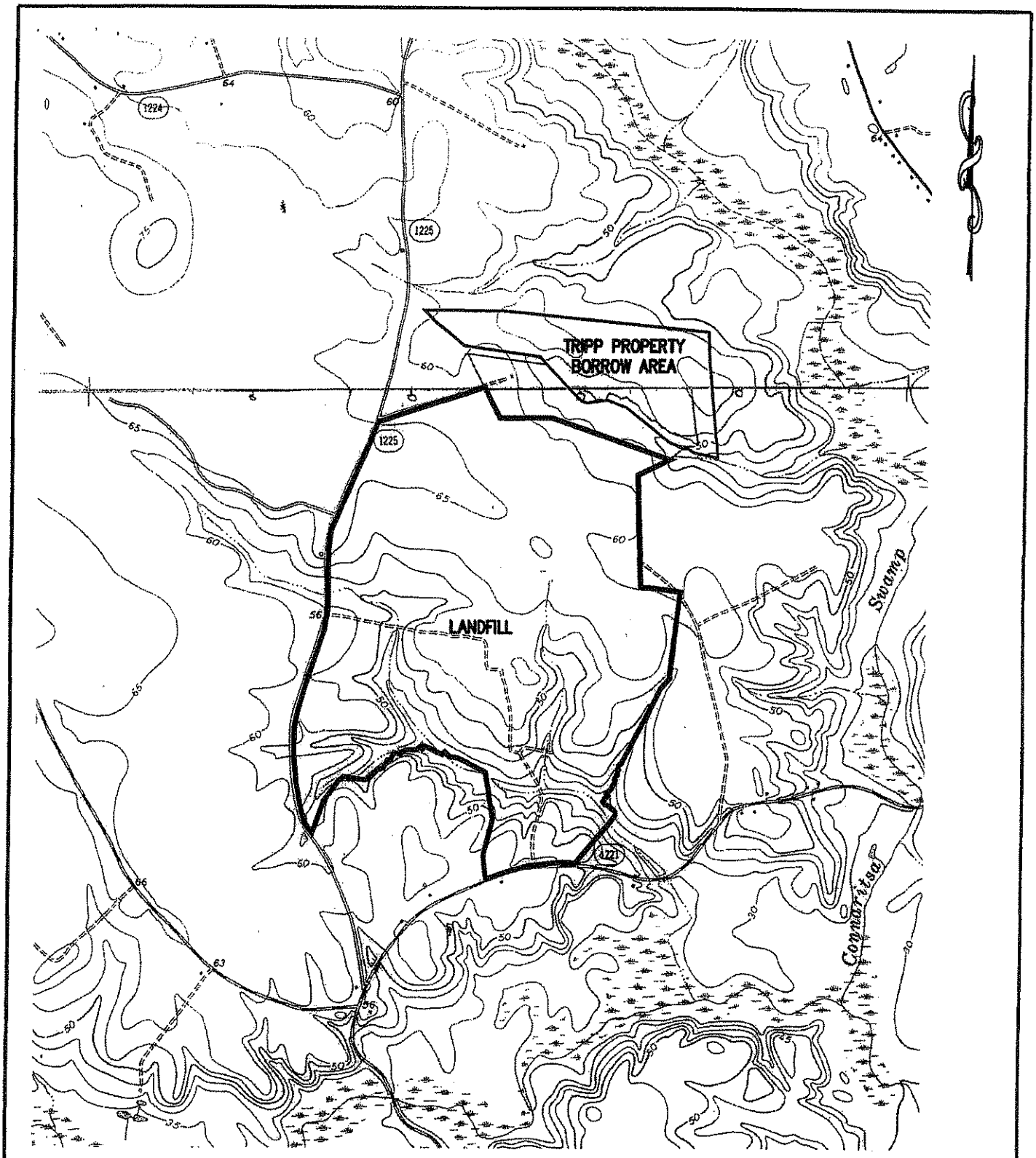
BUNNELL-LAMMONS ENGINEERING, INC.

Jeffrey C. Helvey
Engineering Associate

Daniel B. Bunnell, P.E.
Principal
Registered NC #13814

NORTH CAROLINA PROFESSIONAL SEAL No. 13814 6-20-05 ENGINEER DANIEL B. BUNNELL

Attachments: Figures
Test Pit Records
Laboratory Test Results



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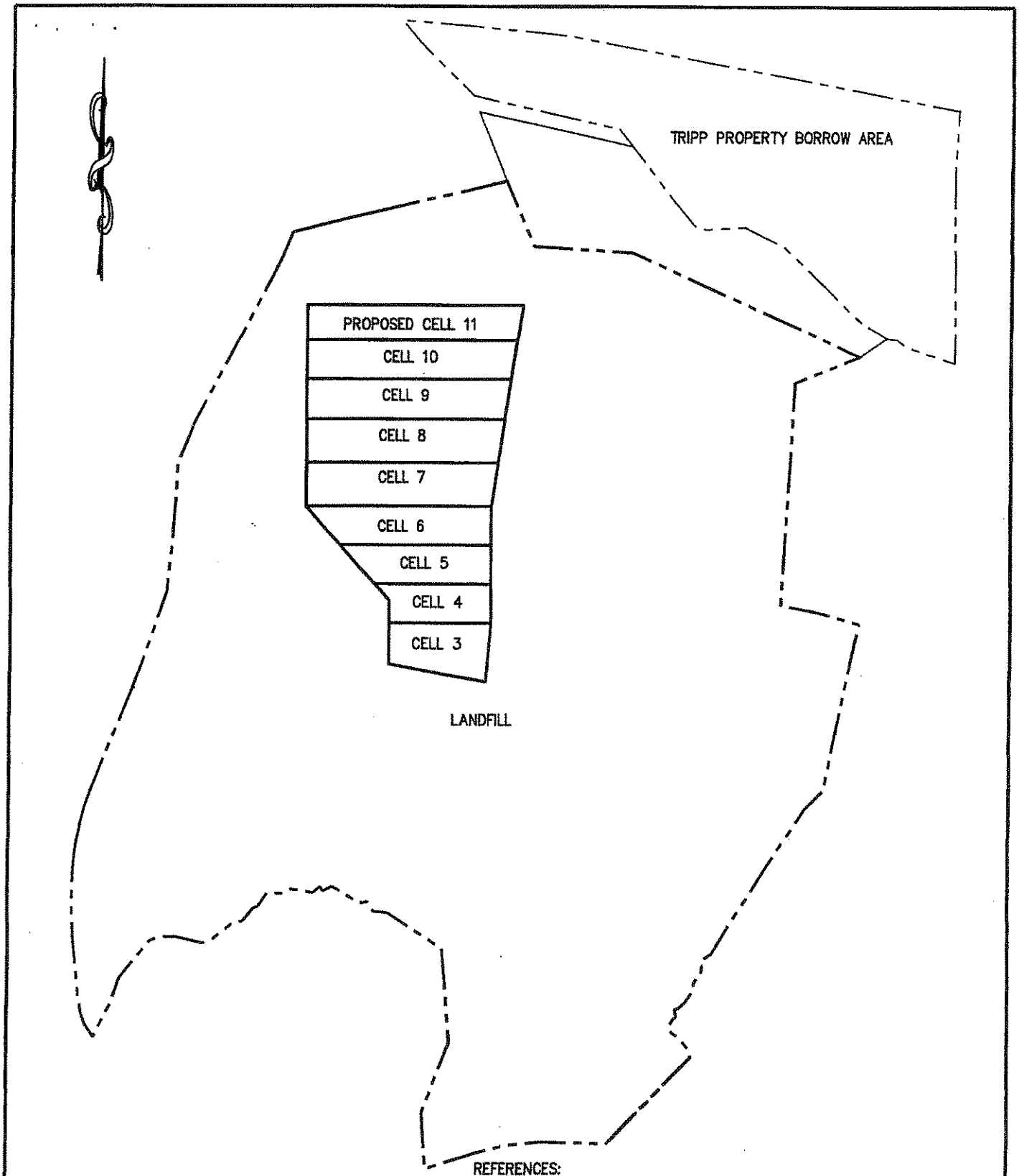
APPROXIMATE SCALE IN FEET

REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES,
AULANDER AND REPUBLICAN, N.C. QUADRANGLES, 1972.

DRAWN: AEH	DATE: 06-06-05	BLE INC. BUNNELL-LAMMONS ENGINEERING, INC. 6004 PONDERS COURT GREENVILLE, SOUTH CAROLINA 29615 PHONE: (864)288-1285 FAX: (864)288-4430	VICINITY MAP EAST CAROLINA MSW LANDFILL BERTIE COUNTY, NORTH CAROLINA	FIGURE 1
CHECKED: JCH	CAD: ECLF51-VM			
APPROVED:	JOB NO: J05-1001-51			



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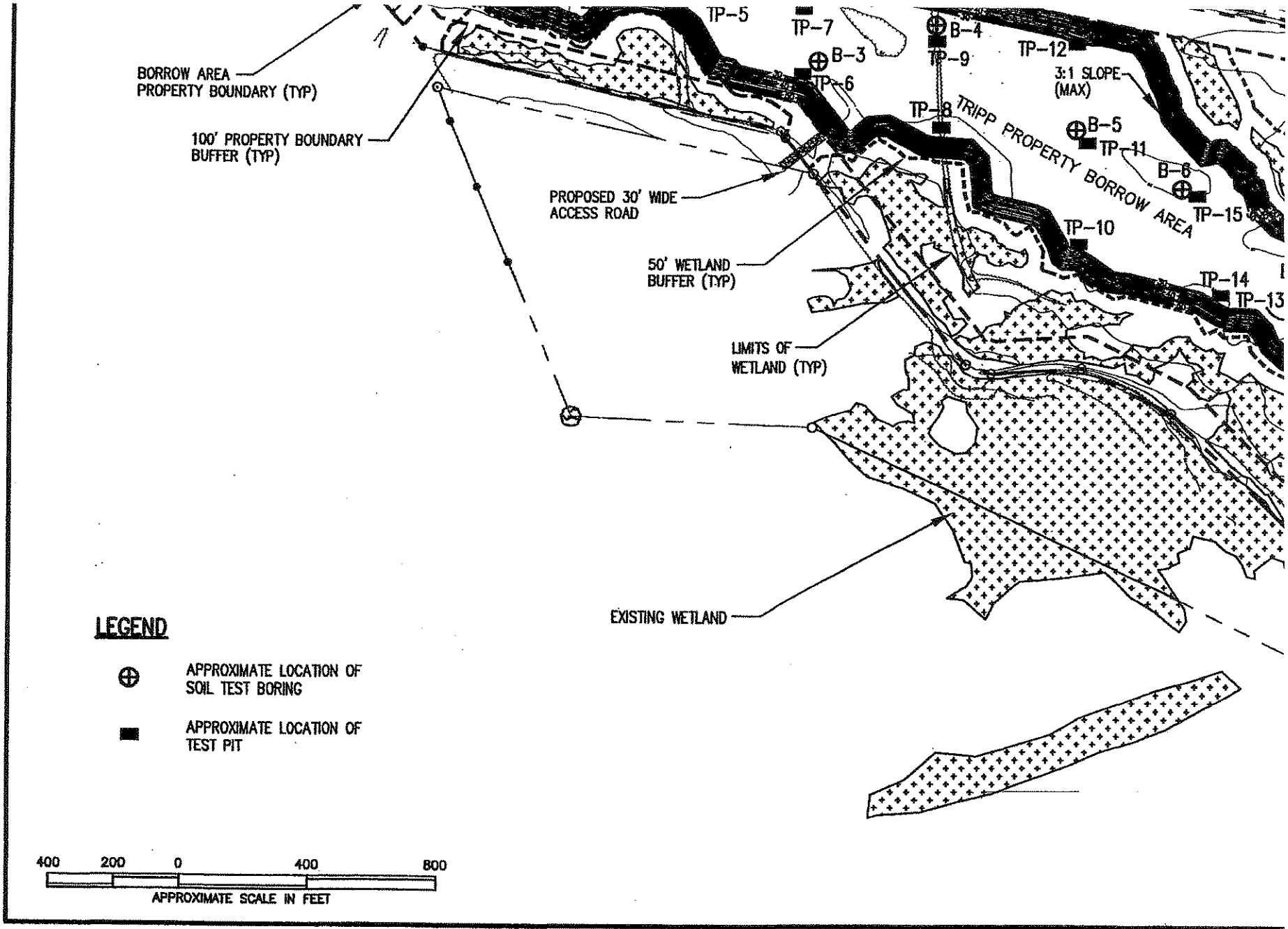
APPROXIMATE SCALE IN FEET

REFERENCES:

1. DRAWING TITLED "POTENTIOMETRIC SURFACE CONTOUR MAP (LAYER IV AQUIFER) – OCTOBER 26, 2004" BY BLE DATED 12-29-04.
2. DRAWING TITLED "GRADING PLAN" BY HODGES, HARBIN, NEWBERRY AND TRIBBLE, INC., DATED 6-21-02.

DRAWN: AEH	DATE: 06-06-05	BLE INC. BUNNELL-LAMMONS ENGINEERING, INC. 8004 POINDEXTER COURT GREENVILLE, SOUTH CAROLINA 29615 PHONE: (864)269-1265 FAX: (864)269-4430	SITE LOCATION MAP EAST CAROLINA MSW LANDFILL BERTIE COUNTY, NORTH CAROLINA	FIGURE 2
CHECKED: JCH	CAD: ECLF51-SLM			
APPROVED:	JOB NO: J05-1001-51			



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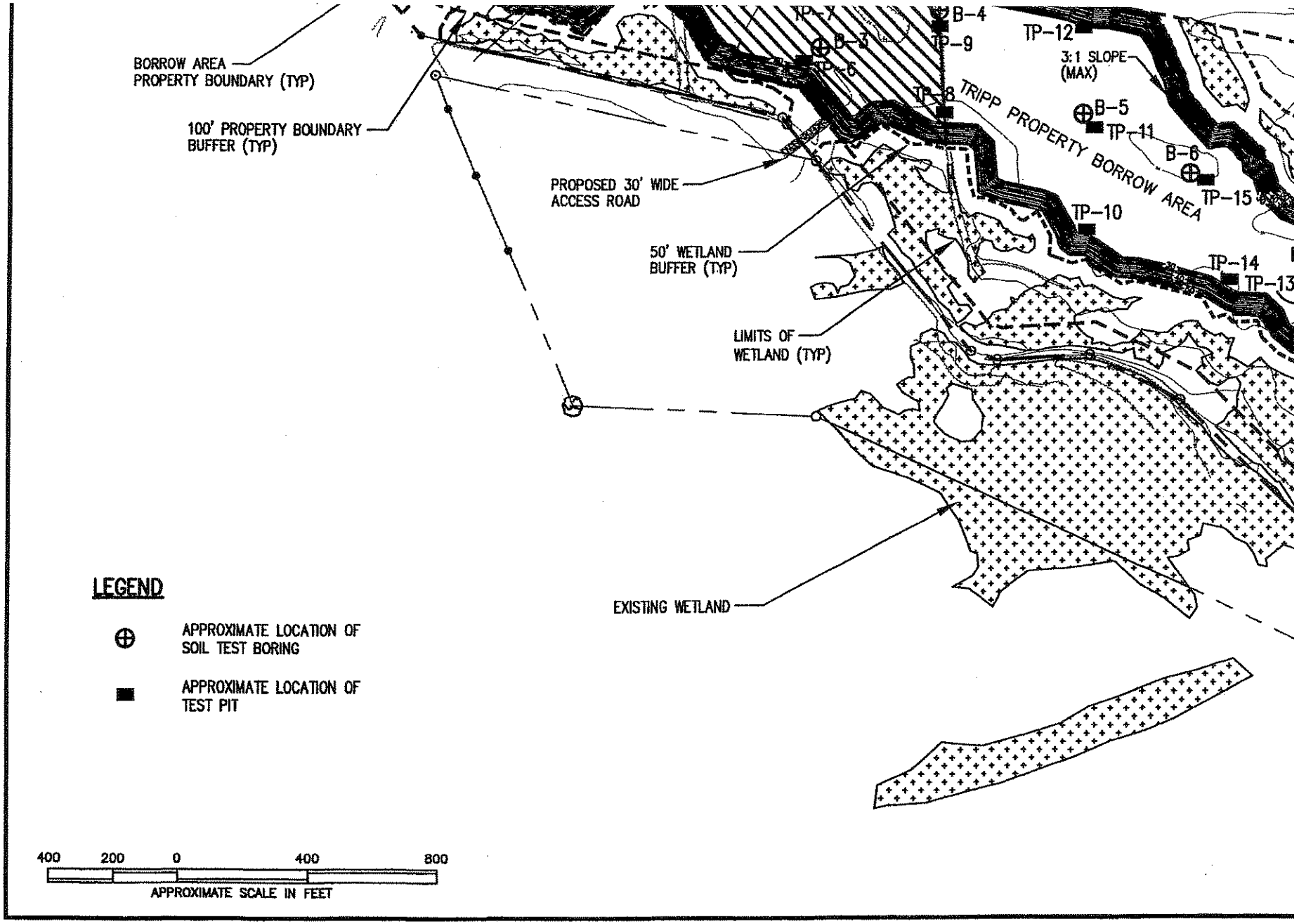
APPROVED BY:		JOB NO:	J05-1001-51			

BLE INC.

BUNNELL-LAMMONS ENGINEERING
8004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 296
PHONE: (864)288-1285 FAX: (864)28



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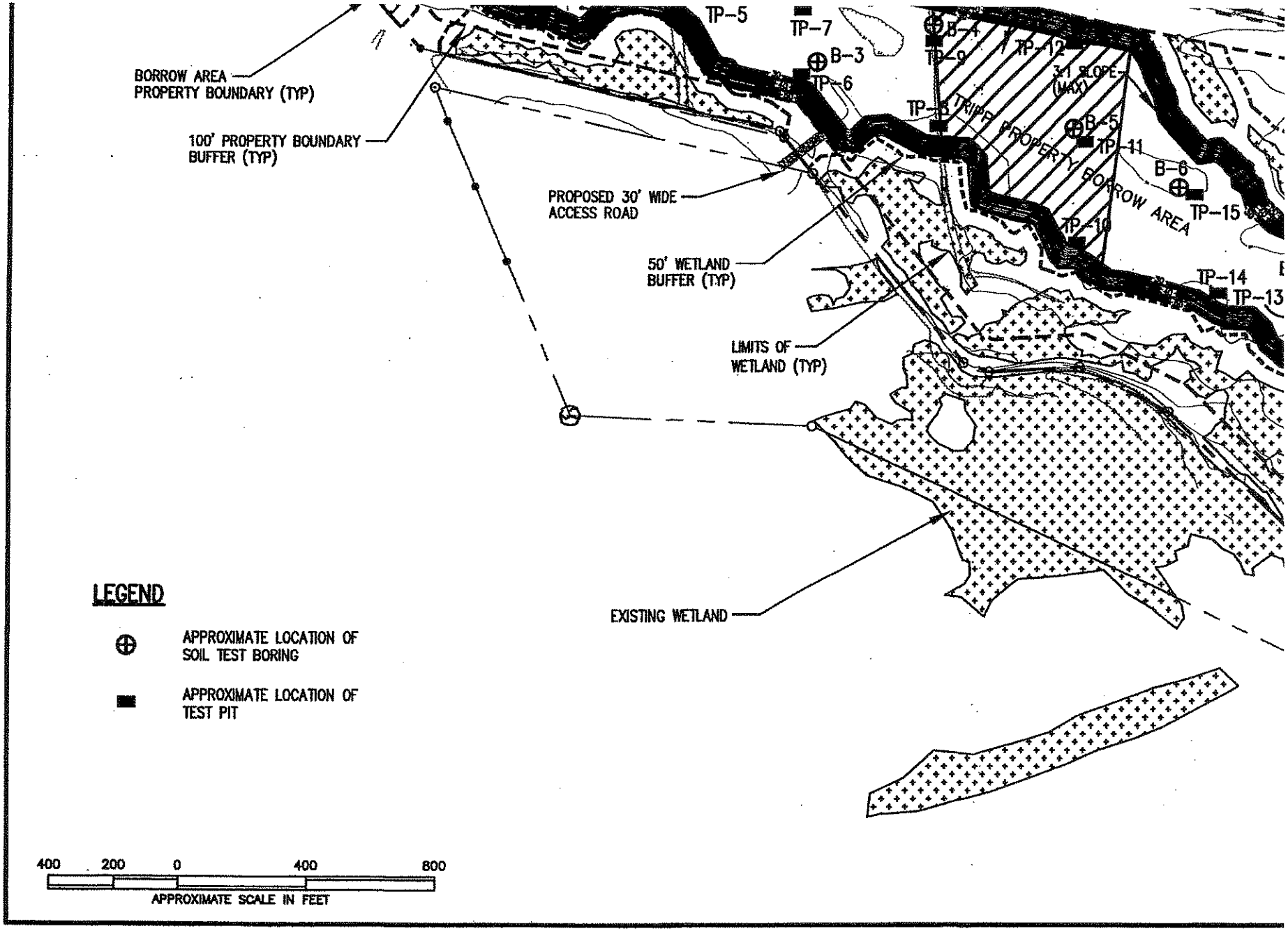
APPROVED BY:		JOB NO:	J05-1001-51			

BLE INC.

BUNNELL-LAMMONS ENGINEERIN

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29
PHONE: (864)288-1265 FAX: (864)28



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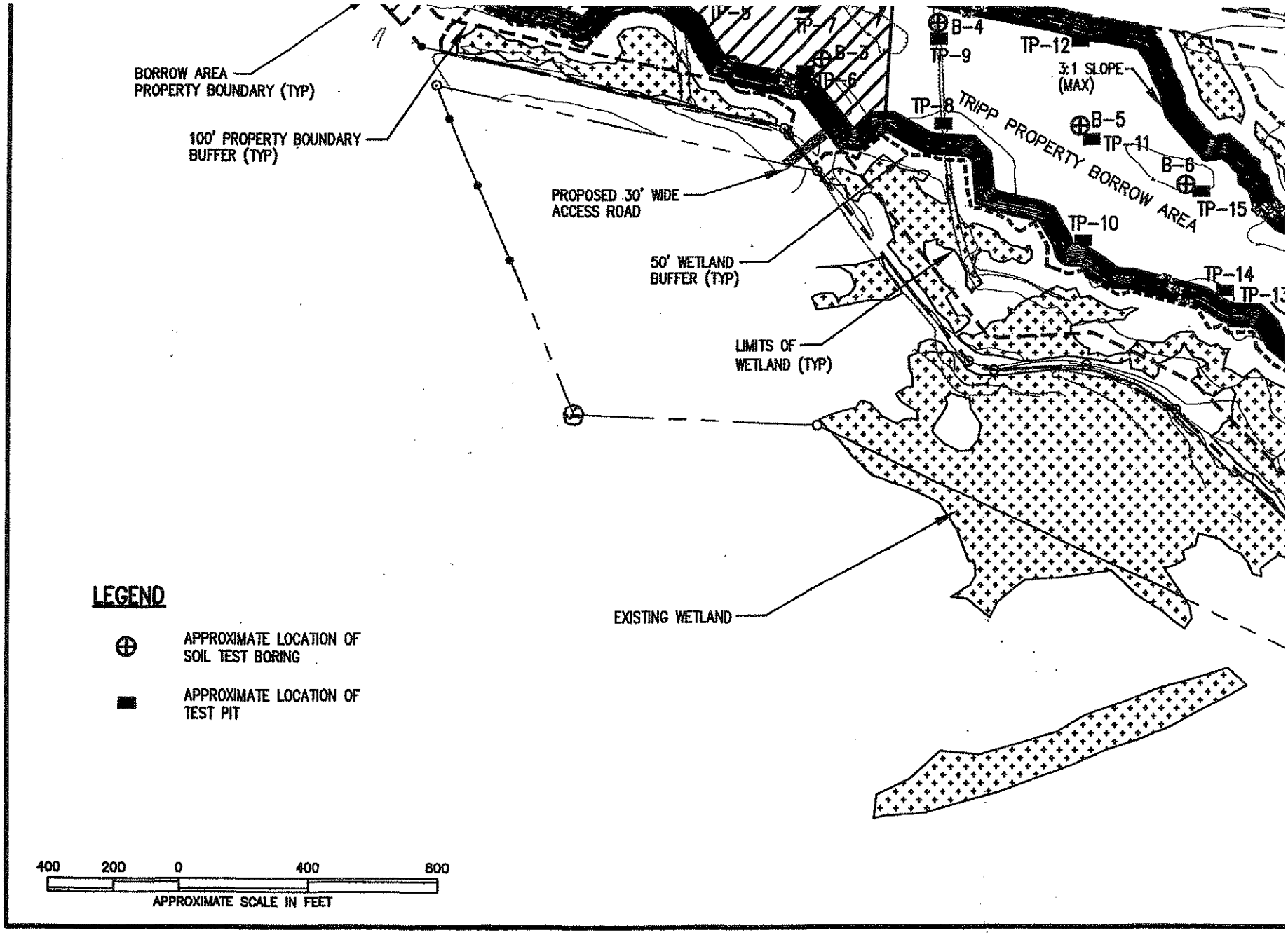
CHECKED BY: JCH	FILE: ECLF51-SFBS	No. / DESCRIPTION / BY	
APPROVED BY:	JOB NO: J05-1001-51		

BLE INC.

BUNNELL-LAMMONS ENGINEERING

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 296
PHONE: (864)288-1265 FAX: (864)28



DRAWN BY: AEH	DATE: 06-17-05	REVISIONS	
CHECKED BY: JCH	FILE: ECLF51-PCSBS	No. / DESCRIPTION / BY	
APPROVED BY:	JOB NO: J05-1001-51		

BLE INC.

BUNNELL-LAMMONS ENGINEERIN

6004 PONDERS COURT
GREENVILLE, SOUTH CAROLINA 29
PHONE: (864)288-1285 FAX: (864)2

BLB INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-1

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
DATE EXCAVATED: 5-24-05
LOCATION: Bertie County, North Carolina
ELEVATION:
EXCAVATOR: East Carolina MSW Landfill
LOGGED BY: C. Brown
EXCAVATION METHOD: Kobelco 300 Excavator
DEPTH TO - WATER> INITIAL: 6.75 AFTER 24 HOURS: CAVING> 13

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Light brown, slightly to no clayey, fine sandy SILT			
2				Bulk sample,2
	Gray, brown and reddish-brown, silty, clayey, fine SAND			
4				
				Composite sample,2.75
6				
8				
	Slightly clayey to clayey, silty, fine SAND			
10				
12				
				Bulk sample,12.5
14	Test pit terminated at 13 feet. Some water was encountered at 6.75 feet. Strong flow at 8.75 feet. Test pit caved at 13 feet. Test pit backfilled at completion.			
16				

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-2

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-24-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: CAVING> 15.75

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Brown and gray, silty, fine SAND			
2	Light brown and brown, clayey, silty, fine SAND			
4				Bulk sample,3.5
	Brown and gray to gray, silty, clayey, fine SAND Irregular thin horizontal layers of brown, slightly silty, fine SAND			
6				
				Baggie sample,7
8				
10				
	Gray and reddish-brown, silty, fine SAND with gray, fine sandy clay nodules			
				Bulk sample,11
12	Yellow, gray and reddish-brown, silty, fine SAND with gray, fine sandy, clayey nodules			
14				
				Baggie sample,15
16	Test pit terminated at 15.75 feet. Ground water encountered at 11 feet at time of excavation. Some caving at 11.0 feet. Test pit caved at 15.75 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-3

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
DATE EXCAVATED: 5-24-05
LOCATION: Bertie County, North Carolina
ELEVATION:
EXCAVATOR: East Carolina MSW Landfill
LOGGED BY: C. Brown
EXCAVATION METHOD: Kobelco 300 Excavator
DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: CAVING> 13

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Gray, silty, fine SAND			
2	Gray, light brown and brown, fine sandy, silty CLAY/clayey SILT			Baggie sample,3
4				
6	Gray, silty, clayey, fine SAND			
	Gray and brown, fine SAND			
8	Gray, slightly clayey to clayey, silty, fine SAND			
10				Baggie sample,11
12	Gray, silty, fine SAND with gray, fine sandy, clay nodules			
14				Baggie sample,14
16	Test pit terminated at 14 feet. Ground water encountered at 11 feet at time of excavation. Test pit caved at 13 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLB INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-4

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-24-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 11 AFTER 24 HOURS: CAVING> 12.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Gray, silty, fine SAND			
2	Tan, brown and light brown, fine sandy, silty CLAY			
4	Gray and light brown, silty, clayey, fine SAND			
6	Gray and light brown, clayey, fine SAND Irregular, thin, horizontal layers of brown or red, silty, fine SAND			
8				Baggie sample,7
10				
12	Brown and gray to gray, silty, fine SAND			
14				
16	Test pit terminated at 14 feet. Some water encountered at 7.75 feet. Ground water encountered at 11 feet at time of excavation. Test pit caved at 12.5 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-5

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
DATE EXCAVATED: 5-25-05
LOCATION: Bertie County, North Carolina
ELEVATION:
EXCAVATOR: East Carolina MSW Landfill
LOGGED BY: C. Brown
EXCAVATION METHOD: Kobelco 300 Excavator
DEPTH TO - WATER> INITIAL: 8 AFTER 24 HOURS: CAVING> 11

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	9-inches of TOPSOIL			
	Red, brown and gray, fine sandy, clayey SILT			
2				Baggie sample,3
4	Gray, silty, fine sandy CLAY			
				Composite sample,4
6				
	Gray and brown, slightly clayey, fine SAND			
8	Light brown and gray, fine sandy, silty CLAY			
				Bulk sample,9
10				
	Gray, silty CLAY			
12				Bulk sample,11.5
	Gray and brown, silty, fine SAND with nodules of gray, silty, fine sandy clay			
14				Baggie sample,14
16	Test pit terminated at 15.5 feet. Groundwater encountered at 8 and 13 feet at time of excavation. Test pit caved at 11 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-6

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 10 AFTER 24 HOURS: CAVING> 10.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	3-inches of TOPSOIL			
	Gray, silty, fine SAND			
	Gray, light brown and reddish-brown, fine sandy, silty CLAY/clayey SILT			
2				
4				Bulk sample,4
	Gray, silty, fine sandy CLAY/clayey, fine SAND			Composite sample,0.75
6				
8				Bulk sample,8
10	Yellow and brown, silty, fine SAND			
12				
14				Baggie sample,13.5
16	Test pit terminated at 14.5 feet. Groundwater encountered at 10 feet at time of excavation. Test pit caved at 10.5 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-7

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 13.5 AFTER 24 HOURS: CAVING> 13.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Gray, silty, fine SAND			
	Gray and brown, fine sandy, silty CLAY			
	Gray and reddish-brown, fine sandy, silty CLAY			
2	Brown, gray and reddish-brown, fine sandy, silty CLAY			Baggie sample,2
4				Bulk sample,3.5
6	Brown and gray, slight to no fine sandy CLAY			Bulk sample,7
8	Gray and brown, fine sandy, silty CLAY Irregular, horizontal layers of brown or gray, clayey, fine sand			
10				
12				
14	Brown and gray, silty, fine SAND			
	Brown, slightly silty, fine SAND with very irregular, horizontal layers of gray, slightly clayey, fine sand			
16				Composite sample,14.75

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-7

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 13.5 AFTER 24 HOURS: CAVING> 13.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
18	Test pit terminated at 17.5 feet. Slight water at 8.75 feet. Groundwater encountered at 13.5 feet at time of excavation. Test pit caved at 13.5 feet. Test pit backfilled at completion.			
20				
22				
24				
26				
28				
30				
32				

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-8

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 12.75 AFTER 24 HOURS: CAVING> 9

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	9-inches of TOPSOIL			
	Gray, silty, fine SAND			
	Gray, brown and light brown, fine sandy, silty CLAY			
2	Brown and gray, silty, clayey, fine SAND			
4				Baggie sample,4.25
6				
	Gray and brown, slightly clayey, silty, fine SAND			
8				Baggie sample,8
	Brown and gray, slight to no clayey, silty, fine SAND with some gray, fine sandy clay nodules			
10				
12				Baggie sample,12
14	Test pit terminated at 13 feet. Ground water encountered at 9 feet and 12.75 feet at time of excavation. Test pit caved at 9 feet. Test pit backfilled at completion.			
16				

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-9

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 10.25 AFTER 24 HOURS: CAVING> 10.25

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Gray and brown, slightly fine sandy, silty CLAY			
2				
4				Bulk sample,4
	Brown and gray, fine sandy, silty CLAY/clayey SILT			
6				
	Gray, silty, clayey, fine SAND Decreasing clay as depth of excavation increases			
8				
				Baggie sample,9.25
10				
	Gray, silty, fine SAND			
	Gray, silty, fine sandy CLAY/clayey, fine SAND			
12				
	Brown, silty, fine SAND			
				Baggie sample,13.25
14				
	Test pit terminated at 14 feet. Ground water encountered at 10.25 feet at time of excavation. Test pit caved at 10.25 feet. Test pit backfilled at completion.			
16				

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-10

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 8 AFTER 24 HOURS: CAVING> 8

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	3-inches of TOPSOIL			
	Gray, slightly clayey, silty, fine SAND			
	Gray, yellow and brown, slight to no fine sandy, silty CLAY			
2				
4				Baggie sample,3.5
	Gray and brown, fine sandy, clayey SILT/silty CLAY Few, horizontal layers of brown, slightly clayey, silty, fine sand			
6				
8	Yellow and brown, silty, fine SAND with few gray, fine sandy, clay nodules			
10				Baggie sample,10
12				
14	Test pit terminated at 13.75 feet. Ground water encountered at 8 and 13.75 feet at time of excavation. Test pit caved at 8 feet. Test pit backfilled at completion.			
16				

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-11

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 9.75 AFTER 24 HOURS: CAVING> 10.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	3-inches of TOPSOIL			
	Gray, silty, fine SAND			
	Yellow, brown and gray, slightly fine sandy, silty CLAY			
2				
4				
				Baggie sample,5
6				
	Gray, silty CLAY			
8	Yellow, brown and gray, slightly fine sandy, silty CLAY			
10	Brown and gray, slightly silty, fine to fine to medium SAND Few gray clay nodules			Baggie sample,10
	Yellowish-brown to brown, silty, fine SAND			
12				
				Baggie sample,13.25
14				
16	Test pit terminated at 15 feet. Ground water encountered at 9.75 and 11.5 feet at time of excavation. Test pit caved at 10.5 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-12

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 8.75 AFTER 24 HOURS: CAVING> 8.75

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	3-inches of TOPSOIL			
	Yellow and brown, fine sandy, silty CLAY			
2				
	Brown and gray, slight to none fine sandy, silty CLAY			Composite sample,0.25
4				
6				
	Gray, silty, clayey, fine sandy CLAY			
8				
	Brown, silty, fine SAND			
	Gray, silty, clayey, fine SAND			
10				
12	Gray, silty, fine SAND			
14				Baggie sample,13.75
16	Test pit terminated at 14.75 feet. Ground water encountered at 8.75 and 11.75 feet at time of excavation. Test pit caved at 8.75 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-13

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: 12.75 AFTER 24 HOURS: CAVING> 8.75

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	9-inches of TOPSOIL			
	Gray, silty, fine SAND			
2	Gray, light brown and brown, fine sandy, silty CLAY			
4				Baggie sample,4
	Brown and gray, fine sandy, silty CLAY/clayey SILT			
6				
8				Baggie sample,7.25
	Gray, clayey, fine SAND Irregular, horizontal layers of brown, silty, fine sand			
10				
12				
	Gray, slightly clayey, silty, fine SAND Irregular, horizontal layers of brown, slight to none silty, fine sand			
14				Baggie sample,13.75
16	Test pit terminated at 14.75 feet. Ground water encountered at 12.75 feet at time of excavation. Test pit caved at 8.75 feet. Test pit backfilled at completion.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-14

PROJECT: East Carolina Landfill - Tripp Property | PROJECT NO.: J05-1001-51

CLIENT: HHNT | DATE EXCAVATED: 5-25-05

LOCATION: Bertie County, North Carolina | ELEVATION:

EXCAVATOR: East Carolina MSW Landfill | LOGGED BY: C. Brown

EXCAVATION METHOD: Kobelco 300 Excavator

DEPTH TO - WATER> INITIAL: ▽ 9.75 AFTER 24 HOURS: ▼ CAVING> 13

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	at 13 feet. Test pit backfilled at completion.			
18				
20				
22				
24				
26				
28				
30				
32				

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

TEST PIT NO. TP-15

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
DATE EXCAVATED: 5-25-05
LOCATION: Bertie County, North Carolina
ELEVATION:
EXCAVATOR: East Carolina MSW Landfill
LOGGED BY: C. Brown
EXCAVATION METHOD: Kobelco 300 Excavator
DEPTH TO - WATER> INITIAL: ▽ AFTER 24 HOURS: ▼ CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	SAMPLE TYPE AND DEPTH IN FEET
	6-inches of TOPSOIL			
	Gray and brown, fine sandy SILT			
2	Gray and reddish-brown, slightly fine sandy, silty CLAY			
4				Baggie sample,3
6	Gray, yellow and brown, silty, fine sandy CLAY Thin horizontal layers of yellow and brown, fine sand			
8				Baggie sample,7
10	Gray, silty, clayey, fine SAND			
	Gray and brown, silty, fine SAND with nodules of gray, fne sandy clay Less nodules as depth of excavation increases			Baggie sample,10.25
12				
14				Baggie sample,14.25
16	Test pit terminated at 14.75 feet.			

TEST PIT WSD 1001-51.GPJ 6/21/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-1

PROJECT: East Carolina Landfill - Tripp Property — PROJECT NO.: J05-1001-51

CLIENT: HHNT — START: 6-1-05 END: 6-1-05

LOCATION: Bertie County, North Carolina — ELEVATION:

DRILLER: Landprobe, JG/TG — LOGGED BY: J. Helvey

DRILLING METHOD: 4-1/4 inch hollow stem auger

DEPTH TO - WATER> INITIAL: ▽ — AFTER 24 HOURS: ▼ 6.8 — CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
2, 4, 6, 8, 10, 12	No sample recovery			
14, 16, 18	Very loose, yellowish-tan, silty SAND			2 2 2
20, 22	Firm, yellowish-tan to grayish-white, coarse SAND			5 6 6
24, 26, 28, 30	Soft, gray, clayey SILT			2 2 2 / 2 1 2
32, 34, 36, 38	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 6.8 feet after 24 hours.			

GEOT_NOWELL 1001-51.GPJ 6/17/05

BLE INC.

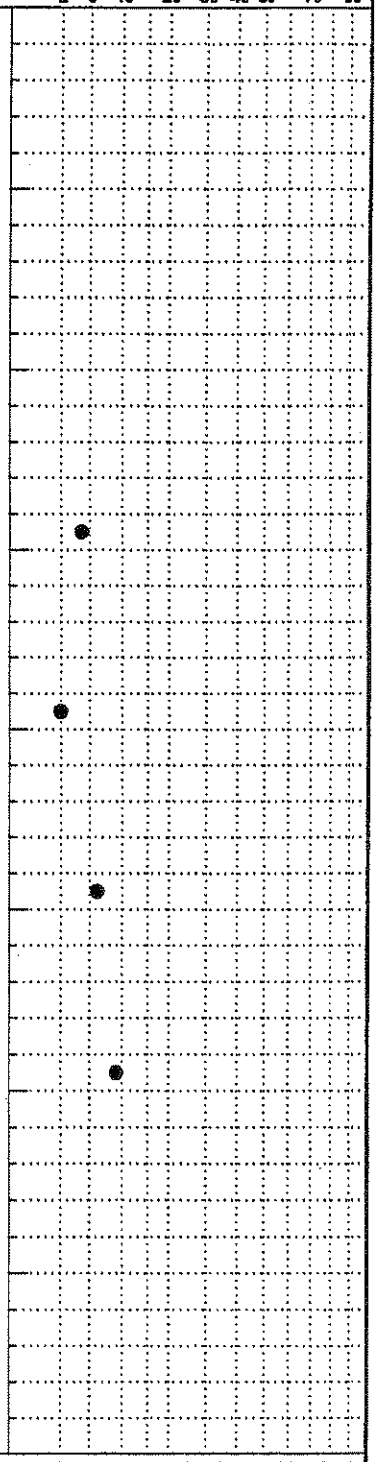
BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-2

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
START: 6-1-05 END: 6-1-05
LOCATION: Bertie County, North Carolina
ELEVATION:
DRILLER: Landprobe, JG/TG
LOGGED BY: J. Helvey
DRILLING METHOD: 4-1/4 inch hollow stem auger
DEPTH TO - WATER> INITIAL: AFTER 24 HOURS: 6.9 CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
2, 4, 6, 8, 10, 12	No sample recovery			
14, 16, 18, 20, 22, 24, 26	Very loose to loose, grayish-white, silty to slightly silty SAND		2 2 2; 0 0 2; 3 3 3	
28, 30	Stiff, gray, clayey SILT		5 5 4	
32, 34, 36, 38	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 6.9 feet after 24 hours.			



GEOT_NOWELL 1001-51.GPJ 6/17/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-3

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
START: 6-1-05 END: 6-1-05
LOCATION: Bertie County, North Carolina
ELEVATION:
DRILLER: Landprobe, JG/TG
LOGGED BY: J. Helvey
DRILLING METHOD: 4-1/4 inch hollow stem auger
DEPTH TO - WATER> INITIAL: ▽ AFTER 24 HOURS: ▼ 5.8 CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	No sample recovery			
2				
4				
6 ▼				
8				
10				
12				
14	Loose, yellowish-tan, silty SAND			3 4 4
16				
18				3 3 3
20	Firm, gray, silty CLAY			
22				
24				2 2 2
26				
28				3 3 3
30				
32	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 5.8 feet after 24 hours.			
34				
36				
38				

GEOT_NOWELL 1001-51.GPJ 6/17/05

BLE INC.

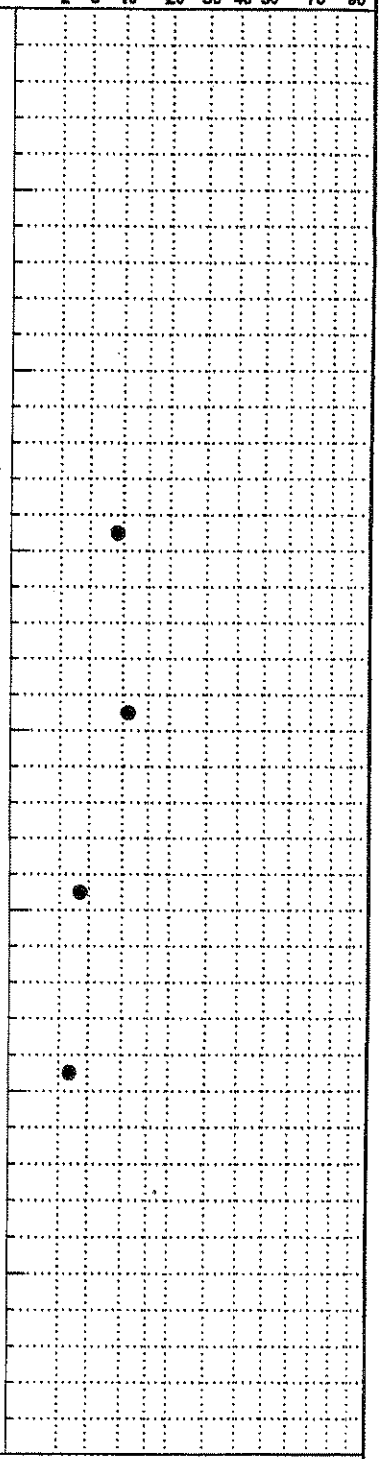
BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-4

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
START: 6-1-05 END: 6-1-05
LOCATION: Bertie County, North Carolina
ELEVATION:
DRILLER: Landprobe, JG/TG
LOGGED BY: J. Helvey
DRILLING METHOD: 4-1/4 inch hollow stem auger
DEPTH TO - WATER> INITIAL: ▽ AFTER 24 HOURS: ▼ 3.5 CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
2, 4, 6, 8, 10, 12	No sample recovery			
14, 16, 18, 20, 22	Loose, reddish-yellow and tan, silty SAND		3 4 5; 3 4 7	
24, 26, 28, 30	Soft, tan to dark brown, sandy, silty CLAY		2 2 2; 2 1 2	
32, 34, 36, 38	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 3.5 feet after 24 hours.			



GEOT_NOWELL 1001-51.GPJ 6/17/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-5

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
START: 6-1-05 END: 6-1-05
LOCATION: Bertie County, North Carolina
ELEVATION:
DRILLER: Landprobe, JG/TG
LOGGED BY: J. Helvey
DRILLING METHOD: 4-1/4 inch hollow stem auger
DEPTH TO - WATER> INITIAL: ▽ AFTER 24 HOURS: ▼ 6.2 CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
2, 4, 6, 8, 10, 12	No sample recovery			
14, 16, 18, 20, 22, 24	Loose, tan to yellowish-tan, silty SAND		3 2 3; 3 4 4; 2 2 2	
26, 28, 30	Soft to firm, gray, clayey SILT		3 2 3	
32, 34, 36, 38	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 6.2 feet after 24 hours.			

GEOT_NOWELL 1001-51.GPJ 6/17/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-6

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
START: 6-1-05 END: 6-1-05
LOCATION: Bertie County, North Carolina
ELEVATION:
DRILLER: Landprobe, JG/TG
LOGGED BY: J. Helvey
DRILLING METHOD: 4-1/4 inch hollow stem auger
DEPTH TO - WATER> INITIAL: ▽ AFTER 24 HOURS: ▼ 7.3 CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
2, 4, 6, 8, 10, 12	No sample recovery			
14, 16, 18, 20, 22, 24, 26	Loose, yellowish-tan, silty SAND		3 2 4; 3 4 4; 4 2 2	
28, 30	Soft, gray, clayey SILT		2 2 2	
32, 34, 36, 38	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 7.3 feet after 24 hours.			

GEOT NOWELL 1001-51.GPJ 6/17/05

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-7

PROJECT: East Carolina Landfill - Tripp Property
PROJECT NO.: J05-1001-51
CLIENT: HHNT
START: 6-1-05 END: 6-1-05
LOCATION: Bertie County, North Carolina
ELEVATION:
DRILLER: Landprobe, JG/TG
LOGGED BY: J. Helvey
DRILLING METHOD: 4-1/4 inch hollow stem auger
DEPTH TO - WATER> INITIAL: ▽ AFTER 24 HOURS: ▼ 6.7 CAVING> 11.9

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	No sample recovery			
2				
4				
6 ▼				
8				
10				
12				
14	Loose, grayish-yellow to yellowish-tan, silty, fine to coarse SAND increasing in coarse sand content with depth			2 2 2
16				
18				2 2 2
20				
22				
24				2 1 2
26				
28				1 2 2
30				
32	Boring terminated at 30.5 feet. No ground water encountered at time of drilling but was encountered at 6.7 feet after 24 hours. Boring caved at 11.9 feet at time of drilling.			
34				
36				
38				

GEOT_NOWELL 1001-51.GPJ 6/17/05

KEY TO SOIL CLASSIFICATIONS AND CONSISTENCY DESCRIPTIONS

BUNNELL-LAMMONS ENGINEERING, INC.
ASHEVILLE, NORTH CAROLINA

Penetration Resistance* Blows per Foot	Relative Density
SANDS	
0 to 4	Very Loose
5 to 10	Loose
11 to 20	Firm
21 to 30	Very Firm
31 to 50	Dense
over 50	Very Dense

Penetration Resistance* Blows per Foot	Consistency
SILTS and CLAYS	
0 to 2	Very Soft
3 to 4	Soft
5 to 8	Firm
9 to 15	Stiff
16 to 30	Very Stiff
31 to 50	Hard
over 50	Very Hard

*ASTM D 1586

Particle Size Identification

Boulder: Greater than 300 mm
Cobble: 75 to 300 mm
Gravel:
Coarse - 19 to 75 mm
Fine - 4.75 to 19 mm
Sand:
Coarse - 2 to 4.75 mm
Medium - 0.425 to 2 mm
Fine - 0.075 to 0.425 mm
Silt & Clay: Less than 0.075 mm

12	Number of blows in first 6-inches
15	Number of blows in second 6-inches
16	Number of blows in third 6-inches

KEY TO DRILLING SYMBOLS

Grab Sample

Split Spoon Sample

Undistrurbed Sample

Groundwater Table at Time of Drilling

Groundwater Table 24 Hours after Completion of Drilling

KEY TO SOIL CLASSIFICATIONS

Well-graded Gravel
GW

Low Plasticity Clay
CL

Clayey Silt
MH

Silty Sand
SM

Poorly-graded Gravel
GP

Sandy Clay
CLS

Sandy Silt
MLS

Topsoil
TOPSOIL

Partially Weathered Rock
BLDRCBBL

Silty Clay
CL-ML

Sand
SW

Bedrock
BEDROCK

High Plasticity Clay
CH

Silt
ML

Clayey Sand
SC

Concrete
A5

EXPLORATION OF POTENTIAL BORROW AREA - TRIPP PROPERTY

SUMMARY OF POTENTIAL PROTECTIVE COVER SAND (k ≥ 1 E-03 cm/s) & CLAY LINER (k < 1 E-07 cm/s) BORROW TEST DATA

EAST CAROLINA REGIONAL MSW LANDFILL

BERTIE COUNTY, NORTH CAROLINA

Bunnell-Lammons Engineering, Inc. Project Number J05-1001-51

SAMPLE NO. / TEST PIT NO.	SAMPLE DEPTH ft.	MATERIAL DESCRIPTION	PERCENT FINES (<#200 seive) %	PROCTOR PARAMETERS MAXIMUM DRY DENSITY pcf	PROCTOR PARAMETERS OPTIMUM MOISTURE CONTENT %	HYDRAULIC CONDUCTIVITY (ASTM D 5084) (95% Compaction) (>2% over OMC) cm/s	HYDRAULIC CONDUCTIVITY (ASTM D 2434) (Dense) cm/s
TP - 5	4.0 - 6.5	Gray, silty, fine sandy CLAY (CH)	77.1	100.1	19.9	4.2 E-08	—
TP - 6	8.0	Gray, silty, fine sandy CLAY (CL)	81.0	102.9	18.5	5.6 E-08	—
B-1 & B-2	13.5 - 15.5	Yellowish tan and grayish white silty SAND	13.3	—	—	—	3.2 E-03
B-6	13.5 - 15.5	Yellowish tan silty SAND	8.6	—	—	—	1.3 E-02
TP - 6	13.5	Yellow and brown silty fine SAND	8.2	—	—	—	1.7 E-02
TP - 7	14.75 - 17.5	Brown slightly silty, fine SAND with intermittent layers of gray slightly clayey, fine SAND	9.2	—	—	—	1.2 E-02
TP - 11	10	Brown and gray, slightly silty, fine medium SAND with few clay nodules	10.0	—	—	—	3.3 E-03

II

INSTRUCTIONS TO BIDDERS

1. Defined Terms:

Terms used (but not otherwise defined) in these Instructions to Bidders that are defined in the General Conditions of the Contract Documents have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Proposal (each a "Bid") directly to OWNER, as distinct from a sub-bidder, who submits a bid to a Bidder. The term "Successful Bidder" means the Bidder to whom the OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Invitation to Bid, Instructions to Bidders, Bid Form and the proposed Contract Documents.

2. Copies of Bidding Documents:

2.1 Complete sets of the Bidding Documents may be obtained in the number and for the sum, if any, as stated in the Invitation to Bid.

2.2 Complete sets of Bidding Documents must be used in preparing Bids. Neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.3 OWNER and ENGINEER, in making copies of Bidding Documents available on the foregoing terms, do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

3. Qualifications of Bidders:

To demonstrate qualifications to perform the Work, each Bidder shall submit written evidence, such as financial data, previous experience, present commitments and other such data, as may be called for in the Supplementary Conditions, or requested by OWNER. Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract.

4. Examination of Contract Documents and Site:

4.1 It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may affect cost, progress, or performance of the Work, (c) consider federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify ENGINEER of all conflicts, errors or discrepancies in the Contract Documents.

4.2 Reference is made to the Supplementary Conditions for identification of those reports of explorations and tests of subsurface conditions at the site, which have been utilized by ENGINEER in preparation of the Contract Documents. Copies of these reports may be examined, upon request, at a location designated by OWNER.

4.3 Information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site are based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities or others, and OWNER shall have no responsibility for the accuracy thereof.

4.4 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions, appear in Paragraphs 4.2 and 4.3 of the General Conditions.

4.5 Before submitting a Bid, each Bidder may, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data, which pertain to the physical conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, or performance of the Work and which Bidder deems necessary to determine its Bid for performing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

4.6 On request in advance, OWNER will provide each Bidder access to the site to conduct such explorations and tests, as each Bidder reasonably deems necessary for submission of a Bid. Bidder must submit any documentation generated as a result of such explorations and tests to OWNER along with its Bid. Bidder shall fill all holes,

clean up, and restore the site to its former condition upon completion of such explorations and tests, and shall indemnify against, and hold OWNER harmless from, all costs and expenses to effect such restoration, regardless of whether or not such Bidder becomes the Successful Bidder. In addition, the Bidder will indemnify OWNER against and hold OWNER harmless from any damages, liabilities, losses, claims, demands, suits, actions, costs and expenses, including, without limitation, attorneys' fees, arising out of or in connection with or resulting from such explorations and tests.

4.7 The lands upon which the Work is to be performed and access thereto (which shall be provided by OWNER to Contractor) are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor. Any necessary easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents.

4.8 The submission of a Bid will constitute an incontrovertible representation and warranty by Bidder that Bidder has complied with every requirement of this Article 4, that, without exception, the Bid is premised upon performing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey a complete understanding of all terms and conditions for the performance of the Work.

4.9 Each Bidder must properly investigate and consider all relevant factors in the preparation of every Bid that it submits. No claims for financial adjustment to any Contract awarded for the Work will be permitted by OWNER that is based on the lack of such prior information or its effect on the cost of the Work.

5. Interpretations and Addenda:

5.1 All questions about the meaning or intent of the Contract Documents are to be directed to OWNER. Interpretations or clarifications considered necessary by OWNER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by OWNER as having received the Bidding Documents. Questions received less than seven (7) calendar days prior to the date for

opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

5.2 Addenda may also be issued to modify the Bidding Documents, as deemed advisable by OWNER or ENGINEER.

6. Bid Security:

N/A

7. Contract Time:

The time within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the "Contract Time") are set forth in the Bid and the Contract Documents. Bidder shall submit a detailed work schedule with the Bid.

8. Liquidated Damages:

Provisions for liquidated damages are set forth in the Contract Documents.

9. Substitute or "Or Equal" Items:

The materials and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution. No substitution will be considered unless a written request for approval has been submitted by the Bidder and has been received by OWNER at least seven (7) calendar days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute, including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or aspects of the Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of any proposed substitute is upon the Bidder. The ENGINEER's approval or disapproval of a proposed substitution shall be final. If ENGINEER approves any proposed substitution, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon any approval of a substitution made in any other manner.

10. Subcontractors, Suppliers and Others:

10.1 Upon OWNER's request, Bidder shall submit the identity of Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be involved in the Work. Such list shall be accompanied by an experience statement, with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, and other person or organization. OWNER, before the Notice of Award is given, may request the apparent Successful Bidder to submit one or more acceptable substitutes without an increase in Bid price.

If the apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to another Bidder that proposes to use acceptable Subcontractors, Suppliers, and other persons and organizations. Declining to make such a requested substitution will not constitute grounds for sacrificing the Bid Security of any Bidder. Any Subcontractor, Supplier, other person or organization listed and to whom neither OWNER nor ENGINEER makes written objection prior to giving the Notice of Award will be deemed acceptable to OWNER and ENGINEER, subject to revocation of such acceptance after the Effective Date of the Contract.

10.2 No Bidder shall be required to employ any Subcontractor, Supplier, other person or organization against whom Bidder has reasonable objection.

11. Bid Form:

11.1 The Bid Form is included with the Bidding Documents; additional copies may be obtained from OWNER.

11.2 Bids shall be prepared and submitted in accordance these instructions. Any Bid that is not prepared in accordance with these instructions will imply that the corresponding Bidder does not intend to comply with all of the proposed contract conditions. As a result, any such Bids may be rejected at the sole discretion of OWNER.

11.3 Each Bid should be carefully prepared using the Bid Form. All prices shall be stated in words and figures, except where the form provides for figures only.

11.4 All blanks on the Bid Form must be completed in ink.

11.5 Bids by sole proprietorships must be executed by the proprietor whose address must be shown below his signature.

11.6 Each Bidder shall list in the spaces provided in the Bid Form all exceptions and clarifications between its proposal and such documents. If more space is required for such exceptions and clarifications, additional pages may be added. If the Bidder takes no exceptions or has no clarifications, it shall write "None" in the spaces provided. Bids that do not comply with this requirement may be rejected at the sole discretion of OWNER. If the Bidder takes exception, then all such exceptions shall be specific in nature and carefully referenced to the applicable Contract Document and to the applicable section, article, paragraph, and page number thereof. If the Bidder proposes deletion of specific language and substitution of revised language, then such deletion and substitution shall be carefully presented by typing complete paragraphs or articles of the original specific language and incorporating the substitute language. Proposed deletions shall be set off by brackets and strike throughs, thus: [~~delete this language~~], and proposed substitute language shall be indicated by underlining, thus: <u>substitute this language</u>. Exceptions that are general, that make reference to the Bidder's standard terms and conditions, or that make reference to the Bidder's descriptive information as a whole, will not be acceptable. Bids that do not comply with these requirements for the presentation of exceptions may be rejected at the sole discretion of OWNER. If a Bid includes express or implied exceptions that are not listed as required, the requirements of the specifications and documents shall govern.

11.7 Bids by corporations must be executed in the official corporate name by the President or a Vice-President (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the Secretary or an Assistant Secretary. Bidding corporations shall designate the State in which they are incorporated; the address of their principal office; and the names, titles, and business addresses of the president, secretary, and treasurer.

11.8 Bids by partnerships must be executed in the partnership name and signed by a general partner, whose title must appear under the signature and the business address of the partnership must be shown below the signature.

11.9 The names of all persons signing should be typed or printed below the signature. The Bidder's name stated on the Bid shall be the exact legal name of the firm.

11.10 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).

11.11 The address and telephone number for communications regarding the Bid must be shown.

11.12 It shall be the Bidder's responsibility to determine all taxes, permits, and licenses applicable to the Work. The Successful Bidder shall be responsible for the payment of all taxes and permit and license fees applicable to the Work.

11.13 Each Bidder shall submit with its Bid an organizational chart showing the management, supervisory, and technical organization that it proposes to use for the Project, and the names of key personnel. The Successful Bidder's organization will be subject to review and approval by OWNER.

11.14 All names must be typed or clearly imprinted below the signature.

12. Submission of Bids:

12.1 A signed original of the Bid shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted) and name and address of the Bidder, and accompanied by the Bid Security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it. Bids received after the time specified for receipt of Bids will be returned unopened. All Bids shall become the property of OWNER.

12.2 Bids shall be accompanied by a letter, executed by an authorized representative of a corporate surety satisfactory to OWNER, stating that performance and payment bonds will be furnished by the SURETY company to Bidder in the event that it is awarded the Contract.

13. Modification and Withdrawal of Bids:

13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

13.2 If, within twenty-four hours after Bids are opened, any Bidder files a duly signed, written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid Security will be returned. Thereafter, that Bidder will be disqualified from further bidding on the Work to be provided under the Contract Documents.

14. Opening of Bids:

Bids will be opened in private.

15. Bids to Remain Subject to Acceptance: All bids will remain subject to acceptance for sixty days after the day of the Bid opening, but OWNER may, in its sole discretion, release any Bid and return the Bid Security prior to that date.

16. Award of Contract:

16.1 OWNER reserves the right to reject any and all Bids, to waive any and all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the Successful Bidder, and the right to disregard all non-conforming, non-responsive, unbalanced, or conditional Bids. Also, OWNER reserves the right to reject the Bid of any Bidder if OWNER believes that it would not be in the best interests of either or both of OWNER and the Project to make an award to that Bidder, whether because its Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criterion established by OWNER. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

16.2 In evaluating Bids, OWNER will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit

prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award. OWNER reserves the right to exercise complete and unfettered discretion in this evaluation.

16.3 OWNER may consider the qualification and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. OWNER also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data are required to be submitted prior to the Notice of Award.

16.4 OWNER may conduct such investigations as OWNER deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform the Work in accordance with the Contract Documents, to OWNER's satisfaction and within the prescribed time.

16.5 If the Contract is to be awarded, it will be awarded to the Bidder whose evaluation by OWNER indicates to OWNER that the award will be in the best interests of the Project.

16.6 If the Contract is to be awarded, OWNER will give the Successful Bidder a Notice of Award within sixty days after the day of the Bid opening.

17. Signing of Agreement:

When OWNER gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement, with all other Contract Documents attached. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER with the required Performance and Payment Bonds. Within ten (10) days thereafter OWNER shall deliver one (1) fully signed counterpart to Successful Bidder.

18. Contract Security:

Paragraph 5 of the General Conditions sets forth OWNER's requirements as to the Performance and Payment Bonds. When the Successful Bidder delivers the executed

Contract to OWNER, it must be accompanied by the required Performance and Payment Bonds.

19. Confidentiality.

Neither Contractor nor any other Bidder shall discuss the proposed development plans for the Project with the press or make any press releases, public statements or advertisements referring to the Project or the engagement of Contractor by OWNER in connection with the Project, or release any information with respect to the Project for any publication, advertisement or other purpose, without the prior written approval of OWNER. Discussions with a reviewing public authority or official shall be discrete and, insofar as practicable, limited to the technical issues required for performance of the Work. Neither Contractor nor any other Bidder shall release written or oral reports, drawings, calculations or any other information to any parties, other than those specifically listed in the Contract, without the prior written consent of OWNER. Breach of any of the foregoing provisions of this Section 19 shall be grounds for immediate termination of the Contract by OWNER and, in addition to OWNER'S other remedies at law and in equity, complete forfeiture of any sums otherwise payable to Contractor under the Contract. The provisions of this Section 19 shall survive the termination of the Contract and the completion of the Work.

III

BID FORM

(REVISED OCTOBER 10, 2007)

Construction of Cell No. 12

Bid from _____ (hereinafter called "Bidder") [an individual doing business as _____ / a _____ [corporation/ [limited/ general] partnership/ limited liability company]

Bidder's Address: _____

_____

_____

Bidder's contact person for additional information:

Name: _____

Phone: _____

To: Republic Services of North Carolina, LLC (hereinafter called "OWNER")
% HHNT
484 Mulberry Street, Suite 265
Macon, Georgia 31201
Attention: Mr. Bill Cooksey

The Bidder, in compliance with your Invitation for Bids, October 1, 2007, having examined the Contract Documents and the site, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies and to construct the Project in accordance with the "Contract Documents" (as such term is defined in the "Instructions to Bidders" attached to your Invitation for Bids), within the time set forth therein, and at the price stated below. This price is to cover all expense incurred in performing the "Work" (as such term is defined in the Contract Documents) as required under the Contract Documents, of which this Bid is a part.

The Bidder declares that the only persons or parties interested in this Proposal are those named herein. The Bidder further declares that this Proposal is made according to the provisions and under

the terms of the Contract Documents, as explained on separate sheets labeled "Clarifications and Exceptions," attached to this Proposal, and that each deviation therefrom is itemized by number and specifically referenced to the particular Contract Document and to the particular section (or paragraph) and page thereof.

The Bidder understands and agrees that the OWNER reserves the right, in its sole discretion and without qualification, to reject any or all proposals, to waive irregularities and informalities in process and proposals received, and to reject nonconforming, non-responsive, or conditional proposals, and any proposals determined not to be in the best interest of either or both of OWNER and the Project. The OWNER reserves the right to enter into separate negotiations with any party for the construction of the Project. The OWNER shall not have any obligation to the Bidder unless and until an "Agreement" (as such term is defined in the Contract Documents) is executed between the OWNER and the Bidder. Expenses associated with the preparation of this Proposal and negotiating the "Contract" (as such term is defined in the Contract Documents) (if applicable) that are incurred by the Bidder shall be the sole responsibility of the Bidder. The Bidder hereby waives any and all claims against the OWNER either for rejection by the OWNER or for the failure of the OWNER to execute an Agreement with the Bidder for any reason.

The Bidder hereby agrees to commence the Work under the Contract on or before a date to be specified in a written "Notice to Proceed" of the OWNER and to fully complete the Work within 120 consecutive calendar days from the "Notice to Proceed" date. An allowance of 20 days for FML installation (by others) will be included in this 120 days. The detailed schedule prepared by the Bidder is attached.

Bidder further agrees to pay, as liquidated damages, the sum of $2,000.00 for each consecutive calendar day thereafter until the Project is completed.

Bidder acknowledges receipt of the following addenda:

_____

Bidder agrees to perform all of the Work described in the Contract Documents for the following prices:

EAST CAROLINA REGIONAL MSW LANDFIL
CELL NO. 12

BID FORM - SEPTEMBER 2007
REVISED OCTOBER 10, 2007

	UM	Approx. Quantity	Unit Price	Total Price
Cell Construction				
1. Mobilization				
a. Mobilization ($50,000 Max. Allowable)	LS	1	$ _____	$ _____
2. General Conditions				
a. General Conditions including Performance and Payment Bonds	LS	1	$ _____	$ _____
3. Surveying				
a. Construction Staking	LS	1	$ _____	$ _____
b. Marker Posts (installation only, materials provided by Owner)	EA	29	$ _____	$ _____
4. Site Preparation				
a. Clearing & Grubbing	AC	15	$ _____	$ _____
b. Topsoil Strip and Stockpile	AC	15	$ _____	$ _____
5. Excavation				
a. Contracted Excavation (Unclassified) (to be used as structural fill in cell construction)	CY	8,000	$ _____	$ _____
b. Remove and Replace Unsuitable Material	CY	8,000	$ _____	$ _____
6. Soil Fill and Berms				
a. Structural Fill (from borrow area)	CY	138,000	$ _____	$ _____
7. Clay Liner				
a. Installation - Compacted Clay Liner including subgrade preparation, haul, placement, compaction and fine grading (includes unloading all geosynthetics)	CY	50,000	$ _____	$ _____

	UM	Approx. Quantity	Unit Price	Total Price
8. Geosynthetic Liner				
a. 60 mil HDPE Flexible Membrane Liner (Smooth) (by Owner)	SF	496,000	$ N/A	$ N/A
b. 60 mil HDPE Flexible Membrane Liner (Textured) (by Owner)	SF	171,000	$ N/A	$ N/A
c. 60 mil HDPE Rub Sheet (by Owner)	SF	1,700	$ N/A	$ N/A
d. 60 mil HDPE for Rain Flap Berm (by Owner)	SF	63,000	$ N/A	$ N/A
e. Anchor Trench including open and backfill	LF	2,200	$	$
f. Rain Flap Berms (construct only, geomembrane provided by Owner)	LF	2,900	$	$
9. Leachate Collection				
a. 8" Dia. Perforated HDPE Leachate Pipe including sleeves, ASTM No. 57 and No. 89 Stone, 6 osy filter geotextile, and 24 osy cushion geotextile **(stone and 6 osy filter geotextile provided by Owner)**	LF	2,400	$	$
b. 4" Dia. Perforated HDPE Secondary Leachate Collection Pipe with 6.0 osy Geotextile Sock (including all fittings)	LF	6,100	$	$
c. 8" Solid Leachate Pipe (inside cell) with 6 osy Fabric Sock	LF	690	$	$
d. Leachate Toe Drain, Complete including 8" Dia. Perforated HDPE Leachate Pipe including sleeves, ASTM No. 57 Stone, 24 osy Cushion Geotextile, and 6 osy Filter Geotextile **(stone and 6 osy filter geotextile provided by Owner)**	LF	700	$	$
e. Leachate Sump No. 12A, Complete including 24" Dia. HDPE Risers (2 - 88 L.F. each) with 8'x8'x2" flat stock plates, blind flanges, Geosynthetic Clay Liner (GCL) (GCL provided by Owner) and ASTM No. 57 Stone (stone provided by Owner)	LS	1	$	$

	UM	Approx. Quantity	Unit Price	Total Price
f. Leachate Sump No. 12B, Complete including 24" Dia. HDPE Risers (2 - 153 L.F. each) with 8'x8'x2" flat stock plates, blind flanges, Geosynthetic Clay Liner (GCL) (GCL provided by Owner) and ASTM No. 57 Stone (stone provided by Owner)	LS	1	$	$
g. Submersible Leachate Sump Pump System No. 12A, Complete including Pump, Side Entry Connection, Drop Pipe, Fittings, Valves, Electrical, Controls, Insulation, and Heat Tape	LS	1	$	$
h. Submersible Leachate Sump Pump System No. 12B, Complete including Pump, Side Entry Connection, Drop Pipe, Fittings, Valves, Electrical, Controls, Insulation, and Heat Tape	LS	1	$	$
i. Leachate Cleanout with Marker Post	EA	4	$	$
10. Liner Protection				
a. Install Only Protective Cover Native Sandy Soil - 24" Thick (K ≥ $1x10^{-3}$ cm/sec) in-place including selective removal from on-site borrow area, haul and installation	CY	40,100	$	$
b. Protective Cover Washed Sand - 24" Thick (K ≥ 10^{-2} cm/sec) in-place including ~~material, haul, and installation~~ haul from stockpile and installation (material provided by Owner)	CY	6,100	$	$
c. 6 osy Geotextile Fabric (by Owner)	SF	454,000	$	$
Landfill UOC Infrastructure				
11. Site Preparation				
a. Clearing and Grubbing	AC	9	$	$
c. Topsoil Strip and Stockpile	AC	9	$	$
d. Permanent Grassing	AC	7	$	$
e. Temporary Grassing	AC	7	$	$
f. Inlet Protection	EA	1	$	$
g. Silt Fence (as shown or as directed by Owner)	LF	1,000	$	$

	UM	Approx. Quantity	Unit Price	Total Price
h. Excelsior Lined Stormwater Conveyance Channel (SCC) with 6 foot bottom width.	LF	2,300	$	$
i. Excelsior Lined Stormwater Conveyance Channel (SCC) with 2 foot bottom width.	LF	2,800	$	$
12. Leachate Handling				
a. 2" Dia. HDPE Dual Contained Force Main	LF	120	$	$
b. 6" Dia. HDPE Dual Contained Force Main	LF	2,400	$	$
c. Tie 6"x10" HDPE Dual Contained Force Main into Existing Manhole No. 11	EA	1	$	$
d. Leachate Tie-In at Leachate Sump 12A	EA	1	$	$
e. Leachate Stub-Out at Leachate Sump 12B	EA	1	$	$
f. Cut and Cap Existing Leachate Pipe	EA	1	$	$
13. Excavation				
a. Contracted Excavation (Unclassified) (to be used as structural fill in road and berm construction)	CY	1,000	$	$
b. Remove and Replace Unsuitable Material	CY	7,000	$	$
14. Soil Fill and Berms				
a. Structural Fill (from Borrow Area)	CY	170,000	$	$
15. Access Road				
a. All Weather Access Road including Stone and Fabric (stone and fabric provided by Owner)	SY	8,600	$	$
16. Litter Fence				
a. Litter Fence including Posts and Litter Net	LF	2,300	$	$
TOTAL BASE BID				$

NOTE: All item numerals are not shown. The item numerals shown represent the Owner's numbering system.

The unit and lump sum prices shown above include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, taxes, and other costs necessary to complete the furnished work of the several kinds called for. The Bidder is solely responsible to provide sufficient materials, equipment, and effort to complete the work.

The Bidder declares that it understands (a) that the quantities shown for unit price items are approximate only and are subject to either increases or decreases, (b) that, if the quantities of any of the items or work are increased, the Bidder proposes to do the additional work at the prices stated herein; and if such quantities are decreased, the Bidder also understands that payment will be made on the basis of the actual quantities at the unit price bid and will make no claim for anticipated profits for any decreases in quantities, and (c) that actual quantities will be determined upon completion of the Work at which time adjustments will be made to the contract amount by direct increase or decrease.

The Bidder will designate _____ as onsite superintendent. This designation cannot be changed without the prior written approval of OWNER.

The Bidder further agrees that, in case of failure on its part to execute the Agreement and to post the "Payment Bond" and the "Performance Bond" (as both such terms are defined and required by the Contract Documents) within ten (10) days after notification of award of contract, the Bid Bond or Certified Check accompanying this Proposal, and the monies payable thereon, shall be paid to the OWNER as liquidated damages for such failure, otherwise the check or Bid Bond accompanying this Proposal shall be returned to the Bidder according to the provisions of the "Instructions to Bidders."

Attached is a _____
for the sum of _____

Dollars ($), according to the conditions of the "Instructions to Bidders."

SEAL (if bid is by Corp.)

_____

Bidder

_____

By

_____

Title

_____

Address

PROPOSAL (CONTINUED)
EXCEPTIONS AND CLARIFICATIONS

The Bidder shall state below all exceptions and clarifications taken to the Contract Documents. The Bidder shall identify both the Contract Document and the section, article, paragraph, and page number to which such exceptions and clarifications apply. Additional pages, if required, shall be submitted. In addition, the Bidder shall attach a copy of the Contract Documents to which such exceptions and clarifications apply, with proposed deletions set off by brackets and strike throughs, thus: [~~delete this language~~], and with proposed substitute language indicated by underlining, thus: substitute this language

COMMERCIAL EXCEPTIONS:

COMMERCIAL CLARIFICATIONS:

TECHNICAL EXCEPTIONS:

TECHNICAL CLARIFICATIONS:

Bidder _____

By _____
(Signature)

(Print or Typed)
Title _____

Date _____

III

BID FORM

Construction of Cell No. 12

Bid from _____ (hereinafter called "Bidder") [an individual doing business as _____ / a _____ [corporation/ [limited/ general] partnership/ limited liability company]

Bidder's Address: _____

_____

_____

Bidder's contact person for additional information:

Name: _____

Phone: _____

To: Republic Services of North Carolina, LLC (hereinafter called "OWNER")
% HHNT
484 Mulberry Street, Suite 265
Macon, Georgia 31201
Attention: Mr. Bill Cooksey

The Bidder, in compliance with your Invitation for Bids, October 1, 2007, having examined the Contract Documents and the site, and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies and to construct the Project in accordance with the "Contract Documents" (as such term is defined in the "Instructions to Bidders" attached to your Invitation for Bids), within the time set forth therein, and at the price stated below. This price is to cover all expense incurred in performing the "Work" (as such term is defined in the Contract Documents) as required under the Contract Documents, of which this Bid is a part.

The Bidder declares that the only persons or parties interested in this Proposal are those named herein. The Bidder further declares that this Proposal is made according to the provisions and under

the terms of the Contract Documents, as explained on separate sheets labeled "Clarifications and Exceptions," attached to this Proposal, and that each deviation therefrom is itemized by number and specifically referenced to the particular Contract Document and to the particular section (or paragraph) and page thereof.

The Bidder understands and agrees that the OWNER reserves the right, in its sole discretion and without qualification, to reject any or all proposals, to waive irregularities and informalities in process and proposals received, and to reject nonconforming, non-responsive, or conditional proposals, and any proposals determined not to be in the best interest of either or both of OWNER and the Project. The OWNER reserves the right to enter into separate negotiations with any party for the construction of the Project. The OWNER shall not have any obligation to the Bidder unless and until an "Agreement" (as such term is defined in the Contract Documents) is executed between the OWNER and the Bidder. Expenses associated with the preparation of this Proposal and negotiating the "Contract" (as such term is defined in the Contract Documents) (if applicable) that are incurred by the Bidder shall be the sole responsibility of the Bidder. The Bidder hereby waives any and all claims against the OWNER either for rejection by the OWNER or for the failure of the OWNER to execute an Agreement with the Bidder for any reason.

The Bidder hereby agrees to commence the Work under the Contract on or before a date to be specified in a written "Notice to Proceed" of the OWNER and to fully complete the Work within 120 consecutive calendar days from the "Notice to Proceed" date. An allowance of 20 days for FML installation (by others) will be included in this 120 days. The detailed schedule prepared by the Bidder is attached.

Bidder further agrees to pay, as liquidated damages, the sum of $2,000.00 for each consecutive calendar day thereafter until the Project is completed.

Bidder acknowledges receipt of the following addenda:

_____

Bidder agrees to perform all of the Work described in the Contract Documents for the following prices:

EAST CAROLINA REGIONAL MSW LANDFIL
CELL NO. 12

BID FORM - SEPEMBER 2007

	UM	Approx. Quantity	Unit Price	Total Price
Cell Construction				
1. Mobilization				
a. Mobilization ($50,000 Max. Allowable)	LS	1	$	$
2. General Conditions				
a. General Conditions including Performance and Payment Bonds	LS	1	$	$
3. Surveying				
a. Construction Staking	LS	1	$	$
b. Marker Posts (installation only, materials provided by Owner)	EA	29	$	$
4. Site Preparation				
a. Clearing & Grubbing	AC	15	$	$
b. Topsoil Strip and Stockpile	AC	15	$	$
5. Excavation				
a. Contracted Excavation (Unclassified) (to be used as structural fill in cell construction)	CY	8,000	$	$
b. Remove and Replace Unsuitable Material	CY	8,000	$	$
6. Soil Fill and Berms				
a. Structural Fill (from borrow area)	CY	138,000	$	$
7. Clay Liner				
a. Installation - Compacted Clay Liner including subgrade preparation, haul, placement, compaction and fine grading (includes unloading all geosynthetics)	CY	50,000	$	$

	UM	Approx. Quantity	Unit Price	Total Price
8. Geosynthetic Liner				
a. 60 mil HDPE Flexible Membrane Liner (Smooth) (by Owner)	SF	496,000	$ N/A	$ N/A
b. 60 mil HDPE Flexible Membrane Liner (Textured) (by Owner)	SF	171,000	$ N/A	$ N/A
c. 60 mil HDPE Rub Sheet (by Owner)	SF	1,700	$ N/A	$ N/A
d. 60 mil HDPE for Rain Flap Berm (by Owner)	SF	63,000	$ N/A	$ N/A
e. Anchor Trench including open and backfill	LF	2,200	$	$
f. Rain Flap Berms (construct only, geomembrane provided by Owner)	LF	2,900	$	$
9. Leachate Collection				
a. 8" Dia. Perforated HDPE Leachate Pipe including sleeves, ASTM No. 57 and No. 89 Stone, 6 osy filter geotextile, and 24 osy cushion geotextile	LF	2,400	$	$
b. 4" Dia. Perforated HDPE Secondary Leachate Collection Pipe with 6.0 osy Geotextile Sock (including all fittings)	LF	6,100	$	$
c. 8" Solid Leachate Pipe (inside cell) with 6 osy Fabric Sock	LF	690	$	$
d. Leachate Toe Drain, Complete including 8" Dia. Perforated HDPE Leachate Pipe including sleeves, ASTM No. 57 Stone, 24 osy Cushion Geotextile, and 6 osy Filter Geotextile	LF	700	$	$
e. Leachate Sump No. 12A, Complete including 24" Dia. HDPE Risers (2 - 88 L.F. each) with 8'x8'x2" flat stock plates, blind flanges, Geosynthetic Clay Liner (GCL) (GCL provided by Owner) and ASTM No. 57 Stone (stone provided by Owner)	LS	1	$	$
f. Leachate Sump No. 12B, Complete including 24" Dia. HDPE Risers (2 - 153 L.F. each) with 8'x8'x2" flat stock plates, blind flanges, Geosynthetic Clay Liner (GCL) (GCL provided by Owner) and ASTM No. 57 Stone (stone provided by Owner)	LS	1	$	$

	UM	Approx. Quantity	Unit Price	Total Price
g. Submersible Leachate Sump Pump System No. 12A, Complete including Pump, Side Entry Connection, Drop Pipe, Fittings, Valves, Electrical, Controls, Insulation, and Heat Tape	LS	1	$	$
h. Submersible Leachate Sump Pump System No. 12B, Complete including Pump, Side Entry Connection, Drop Pipe, Fittings, Valves, Electrical, Controls, Insulation, and Heat Tape	LS	1	$	$
i. Leachate Cleanout with Marker Post	EA	4	$	$
10. Liner Protection				
a. Install Only Protective Cover Native Sandy Soil - 24" Thick ($K \geq 1x10^{-3}$ cm/sec) in-place including selective removal from on-site borrow area, haul and installation	CY	40,100	$	$
b. Protective Cover Washed Sand - 24" Thick ($K \geq 10^{-2}$ cm/sec) in-place including material, haul, and installation	CY	6,100	$	$
Landfill UOC Infrastructure				
11. Site Preparation				
a. Clearing and Grubbing	AC	9	$	$
c. Topsoil Strip and Stockpile	AC	9	$	$
d. Permanent Grassing	AC	7	$	$
e. Temporary Grassing	AC	7	$	$
f. Inlet Protection	EA	1	$	$
g. Silt Fence (as shown or as directed by Owner)	LF	1,000	$	$
h. Excelsior Lined Stormwater Conveyance Channel (SCC) with 6 foot bottom width.	LF	2,300	$	$
i. Excelsior Lined Stormwater Conveyance Channel (SCC) with 2 foot bottom width.	LF	2,800	$	$
12. Leachate Handling				
a. 2" Dia. HDPE Dual Contained Force Main	LF	120	$	$
b. 6" Dia. HDPE Dual Contained Force Main	LF	2,400	$	$

	UM	Approx. Quantity	Unit Price	Total Price
c. Tie 6"x10" HDPE Dual Contained Force Main into Existing Manhole No. 11	EA	1	$	$
d. Leachate Tie-In at Leachate Sump 12A	EA	1	$	$
e. Leachate Stub-Out at Leachate Sump 12B	EA	1	$	$
f. Cut and Cap Existing Leachate Pipe	EA	1	$	$
13. Excavation				
a. Contracted Excavation (Unclassified) (to be used as structural fill in road and berm construction)	CY	1,000	$	$
b. Remove and Replace Unsuitable Material	CY	7,000	$	$
14. Soil Fill and Berms				
a. Structural Fill (from Borrow Area)	CY	170,000	$	$
15. Access Road				
a. All Weather Access Road including Stone and Fabric	SY	8,600	$	$
16. Litter Fence				
a. Litter Fence including Posts and Litter Net	LF	2,300	$	$
TOTAL BASE BID				$

NOTE: All item numerals are not shown. The item numerals shown represent the Owner's numbering system.

The unit and lump sum prices shown above include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, taxes, and other costs necessary to complete the furnished work of the several kinds called for. The Bidder is solely responsible to provide sufficient materials, equipment, and effort to complete the work.

The Bidder declares that it understands (a) that the quantities shown for unit price items are approximate only and are subject to either increases or decreases, (b) that, if the quantities of any of the items or work are increased, the Bidder proposes to do the additional work at the prices stated herein; and if such quantities are decreased, the Bidder also understands that payment will be made on the basis of the actual quantities at the unit price bid and will make no claim for anticipated profits for any decreases in quantities, and (c) that actual quantities will be determined upon completion of the Work at which time adjustments will be made to the contract amount by direct increase or decrease.

The Bidder will designate _____ as onsite superintendent. This designation cannot be changed without the prior written approval of OWNER.

The Bidder further agrees that, in case of failure on its part to execute the Agreement and to post the "Payment Bond" and the "Performance Bond" (as both such terms are defined and required by the Contract Documents) within ten (10) days after notification of award of contract, the Bid Bond or Certified Check accompanying this Proposal, and the monies payable thereon, shall be paid to the OWNER as liquidated damages for such failure, otherwise the check or Bid Bond accompanying this Proposal shall be returned to the Bidder according to the provisions of the "Instructions to Bidders."

Attached is a _____
for the sum of _____

Dollars ($), according to the conditions of the "Instructions to Bidders."

SEAL (if bid is by Corp.)

_____

Bidder

_____

By

_____

Title

_____

Address

PROPOSAL (CONTINUED)
EXCEPTIONS AND CLARIFICATIONS

The Bidder shall state below all exceptions and clarifications taken to the Contract Documents. The Bidder shall identify both the Contract Document and the section, article, paragraph, and page number to which such exceptions and clarifications apply. Additional pages, if required, shall be submitted. In addition, the Bidder shall attach a copy of the Contract Documents to which such exceptions and clarifications apply, with proposed deletions set off by brackets and strike throughs, thus: [~~delete this language~~], and with proposed substitute language indicated by underlining, thus: substitute this language

COMMERCIAL EXCEPTIONS:

COMMERCIAL CLARIFICATIONS:

TECHNICAL EXCEPTIONS:

TECHNICAL CLARIFICATIONS:

Bidder _____

By _____
(Signature)

(Print or Typed)
Title _____

Date _____

IV

BID BOND

Not Required

V

AGREEMENT

THIS AGREEMENT (this "Agreement"), made as of the _____ day of _____, 20_____ (the "Effective Date") by and between Republic Services of North Carolina, LLC, hereinafter called "OWNER," and _____ _____, [an individual doing business as _____ _____/ a _____ [corporation/ [limited/ general] partnership/ limited liability company], hereinafter called "CONTRACTOR," recites and provides as follows:

RECITALS:

The OWNER is the owner of certain real property located in the County of Bertie, State of North Carolina, and briefly described as **East Carolina Regional MSW Landfill** (the "Landfill").

2. The OWNER desires to arrange for the **Construction of Cell No. 12** (the "Project") on the Land, and the CONTRACTOR desires to construct the Project, all according to the terms and conditions hereafter set forth.

AGREEMENT:

NOW, THEREFORE, for and in consideration of the premises, the mutual covenants and agreements hereafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the OWNER and the CONTRACTOR hereby covenant and agree as follows:

1. The CONTRACTOR shall do all of the following (collectively, the "Work"): perform all construction services, and provide all material, supplies, machinery, equipment, tools, supervision, labor, insurance and other accessories and services, that are necessary to construct and complete the Project as described in the "Contract Documents" (as hereafter defined), including, without limitation, all items specifically included in the Contract Documents as well as all additional items of work that are consistent with, incidental to or inferable from such specifically included items in order to complete the Project in accordance with the Contract Documents. The term "Work" shall also be deemed to refer to the entire completed construction, or the various separately identifiable parts thereof, required to be performed under the Contact Documents, and is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents. The total sum payable to the CONTRACTOR for the Work is

   $_____ (the "Contract Price"). The "Contract Documents" shall consist of this Agreement, the "General Conditions," the "Supplementary Conditions," and the "Schedule of Values" (as each of such terms is identified or defined hereafter) and the "Bonds", the "Specifications", and the "Addenda" (as each of such terms is defined in the

General Conditions). The General Conditions, the Supplementary Conditions and the Schedule of Values are attached as Exhibits D, E and C, respectively. Together, the Contract Documents form the "Contract."

2. The CONTRACTOR shall commence the Work on or before a date to be specified in a written "Notice to Proceed" to be issued by the OWNER and shall complete the Project on or before the date (the "Scheduled Completion Date") that is 120 days after the date specified in such Notice to Proceed. An allowance of 20 days for FML installation (by others) will be included in this 120 days. Time is of the essence to this Contract. It shall be the responsibility of the CONTRACTOR to schedule and coordinate the Work such that it is completed by the Scheduled Completion Date.

3. The OWNER shall pay the Contract Price in current funds, subject to additions and deductions, as provided in the General Conditions and shall make payments on account thereof as provided in the General Conditions.

4. All notices, requests, demands, claims and other communications required or permitted under the Contract shall be in writing, shall be delivered in person or by mail (first class postage pre-paid), overnight delivery, or telecopy transmission and shall be deemed given when delivered in person or, if not delivered in person, when received (or delivery is refused) by the party to whom such notice, request, demand, claim or other communication is directed, at the following address or telecopy number (or at such other address or telecopy number as a party shall designate by written notice to the other party.)

If to the OWNER:

Republic Services of North Carolina, LLC
1220 Commerce Street, SW
Conover, NC 28613
Attn.: Mr. Drew Isenhour
Telecopy: (828) 464-6922

Exhibit List

Exhibit	A-1 and A-2 - Bonds
	B - Specifications
	C - Schedule of Values
	D - General Conditions
	E - Supplementary Conditions
	F – Addenda
	G – Contractor's Safety Statement
	H – Certificates of Insurance

EXHIBIT "A-1"

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that,

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____, hereinafter called PRINCIPAL, and
(Corporation, Partnership, or Individual)

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called SURETY, are held and firmly bound unto

_____
(Name of OWNER)

_____
(Address of OWNER)

hereinafter call OWNER, in penal sum of _____
Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that, whereas the PRINCIPAL entered into a certain Agreement with the OWNER, dated the ____ day of _____, 20____ (the "Contract"), a copy of which is attached and made a part hereof, for the construction of:

_____

_____,
hereinafter called the PROJECT.

NOW THEREFORE, if the PRINCIPAL shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety, and during the one year guaranty period, and if the PRINCIPAL shall satisfy all claims and demands incurred under the Contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of the PRINCIPAL's failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default by the PRINCIPAL, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the "WORK" (as defined in the Contract) or to the "SPECIFICATIONS" (as defined in the Contract) shall in any wise affect its obligation on and under this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the PRINCIPAL shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____counterparts, each one of which shall be deemed an original, this the _____day of _____, 20____.

_____

PRINCIPAL

By: _____

ATTEST:

PRINCIPAL's Secretary

(SEAL)

_____

_____

(Address)

Witness as to PRINCIPAL

_____

SURETY

By:_____

ATTEST:

SURETY's Secretary

(SEAL)

_____

_____

(Address)

Witness as to SURETY

NOTE: DATE OF BOND MUST NOT BE PRIOR TO DATE OF CONTRACT. If PRINCIPAL is Partnership, all partners thereof should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

EXHIBIT "A-2"

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that,

_____

(Name of Contractor)

_____

(Address of Contractor)

a _____, hereinafter called PRINCIPAL, and

_____

(Name of Surety)

_____

(Address of Surety)

hereinafter called SURETY, are held and firmly bound unto _____

_____

(Name of OWNER)

_____

(Address of OWNER)

hereinafter called OWNER, in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that, whereas the PRINCIPAL entered into a certain Agreement with the OWNER, dated the _____ day of _____, 20____ (the "Contract") , a copy of which is attached and made a part hereof, for the construction of:

_____

_____,

hereinafter called the PROJECT.

NOW THEREFORE, if the PRINCIPAL shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the "WORK" (as defined in the Contract), and any extension or modification thereof agreed to by the OWNER, including all amounts due for materials consumed or used in connection with the construction of the WORK, and all insurance premiums on the WORK, and for all labor performed in the WORK, whether by any subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the SURETY, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the "SPECIFICATIONS" (as defined in the Contract) shall in any wise affect its obligation on and under this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the PRINCIPAL shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

_____

PRINCIPAL

By: _____

ATTEST:

PRINCIPAL's Secretary

(SEAL)

_____

_____

(Address)

Witness as to PRINCIPAL

_____

SURETY

By:_____

ATTEST:

SURETY's Secretary

(SEAL)

_____

_____

(Address)

Witness as to SURETY

NOTE: DATE OF BOND MUST NOT BE PRIOR TO DATE OF CONTRACT. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570) as amended and be authorized to transact business in the State where the PROJECT is located.

EXHIBIT "B"

SPECIFICATIONS

EXHIBIT "C"

SCHEDULE OF VALUES

EXHIBIT "D"

GENERAL CONDITIONS

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GENERAL CONDITIONS

ARTICLE 1 DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents, the following terms shall have the meanings indicated, which are applicable to both the singular and plural thereof:

Addenda - Written or graphic instruments issued prior to the opening of Bids that clarify, correct or change the bidding documents or the Contract Documents.

Agreement - The written agreement between and executed by OWNER and CONTRACTOR covering the Work; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form accepted by OWNER that is to be used by CONTRACTOR in requesting progress or final payments and that is to include such supporting documentation as is required by the Contract Documents.

Bid - The offer or proposal of a bidder, submitted on the prescribed form, setting forth the prices for the Work to be performed by such bidder.

Bonds - Bid, performance and payment bonds and other instruments of security.

Change Order - A document that is signed by CONTRACTOR and OWNER that authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date.

Contract - Together, the contract formed by the Contract Documents.

Contract Documents - The Agreement, Addenda (which pertain to the Contract Documents), Bid Form (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications including the Drawings, as the same are more specifically identified in the Agreement, together with all change orders.

Contract Price - The monies payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement.

Contract Time - The number of days or the date stated in the Agreement for the completion of the Work.

CONTRACTOR - The person, firm or corporation named as such in the Agreement.

Defective - An adjective that, when modifying the word "Work," refers to Work that is unsatisfactory, faulty or deficient, or that does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or that has been damaged prior to final payment.

Drawings - The drawings that show the character and scope of the Work to be performed and that have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

Effective Date - The date so described in the Agreement, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver it.

ENGINEER - The person, firm or corporation designated as such by the OWNER. The ENGINEER is responsible for the technical aspects of the work.

Field Order - A written order issued by PROJECT MANAGER that orders minor changes in the Work, but that does not involve a change in the Contract Price or the Contract Time.

Laws and Regulations: – All applicable federal, state and local laws, rules, regulations, ordinances, codes and orders.

Notice of Award - The written notice by OWNER to the apparent successful bidder stating that, upon satisfaction by the apparent successful bidder of the conditions precedent enumerated therein, within the time specified therein, CONTRACTOR will execute and deliver the Agreement to OWNER.

Notice to Proceed - A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

OWNER - The Corporation, with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

Partial Utilization - Placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

Project - The total construction of which the Work may be the whole, or a part, as indicated elsewhere in the Contract Documents.

PROJECT MANAGER - The authorized representative of OWNER who is assigned to the site or any part thereof.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data that are specifically prepared by or for CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.

Specifications - Those portions of the Contract Documents consisting of drawings and written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor - An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

Substantial Completion - The Work (or a specified part thereof) has progressed to the point where, in the opinion of PROJECT MANAGER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contact Documents, so that the Work (or specified part thereof) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when final payment is due in accordance with paragraph 14.13, and, in any event, shall include the issuance of all necessary certificates of occupancy and other governmental permits and approvals necessary for the utilization and, where appropriate, occupancy of the Work. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Supplementary Conditions - The portion of the Contract Documents that amends or supplements these General Conditions.

Supplier - A manufacturer, fabricator, supplier, distributor, material man or vendor.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities that have been installed underground to furnish any of the following services or materials: electricity, gas, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Unit Price Work - Work to be paid for on the basis of unit prices.

Work - The entire completed construction, or the various separately identifiable parts thereof, required to be performed under the Contact Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

Work Directive Change - A written directive to CONTRACTOR, issued on or after the Effective Date and signed by PROJECT MANAGER and recommended by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed. A Work Directive Change may not change the Contract Price or the Contract Time, but is evidence that the parties expect that the change directed or documented by Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time.

Written Amendment - A written amendment to the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date and normally dealing with the non-engineering or nontechnical, rather than strictly Work – related, aspects of the Contract Documents.

ARTICLE 2 PRELIMINARY MATTERS

Delivery Bonds:

2.1 When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR also shall deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

Copies of Documents:

2.2 OWNER shall furnish to CONTRACTOR up to six copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

Commencement of Contract Time: Notice to Proceed:

2.3 The Contract Time will commence on the date indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the Effective Date.

Starting the Project:

2.4 CONTRACTOR shall start to perform the Work on the date when the Contract Time commences, but no Work shall be done at the site prior to the date on which the Contract Time commences.

Before Starting Construction:

2.5 Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to PROJECT MANAGER any conflict, error or discrepancy that CONTRACTOR may discover and shall obtain a written interpretation or clarification from PROJECT MANAGER before proceeding with any Work affected thereby; provided, that CONTRACTOR shall not be liable to OWNER for failure to report any conflict, error or discrepancy in the Contract Documents, unless CONTRACTOR had actual knowledge, or should reasonably have known, thereof.

2.6 Within ten (10) days after the Effective Date (unless otherwise specified in the General Requirements), and before beginning the work, CONTRACTOR shall submit to PROJECT MANAGER for review:

2.6.1 An estimated progress schedule indicating the starting and completion dates of the various stages of the Work;

2.6.2 A preliminary schedule of Shop Drawing submissions.

2.6.3 A project specific health and safety plan.

2.7 Before any Work at the site is started, CONTRACTOR shall deliver to PROJECT MANAGER certificates (and other evidence of insurance requested by OWNER) that CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.3 and 5.4.

Preconstruction Conference:

2.8 Within twenty days after the Effective Date, but before CONTRACTOR starts the Work; a conference among PROJECT MANAGER, CONTRACTOR, ENGINEER and others, as appropriate, will be held to discuss the schedules referred to in paragraph 2.6, to discuss procedures for handling Shop Drawings and other submissions and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work.

Finalizing Schedules:

2.9 At least ten (10) days before submission of the first Application for Payment, CONTRACTOR, PROJECT MANAGER and others, as appropriate, will finalize the schedules submitted in accordance with paragraph 2.6. The finalized progress schedule will be acceptable to PROJECT MANAGER if it provides for an orderly progression of the Work to Completion within the Contract Time, but such acceptance will not impose on PROJECT MANAGER responsibility therefor. The finalized schedule of Shop Drawing submissions will be acceptable to PROJECT MANAGER if it provides a workable arrangement for processing such submissions.

ARTICLE 3 CONTRACT DOCUMENTS: INTENT, AMENDMENT, REUSE

Intent:

3.1 The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2 It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents, as being required to produce the intended result will be supplied whether or not specifically called for. When words that have a well-known technical or trade meaning are used to describe Work, materials or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference is specific or implied, shall mean the latest standard specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date if there were no Bids), except as may specifically be stated otherwise. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their consultants, agents or employees, from those set forth in the Contract Documents

3.3 If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall report it to PROJECT MANAGER in writing at once and before proceeding with the Work affected thereby, and shall obtain a written interpretation or clarification from PROJECT MANAGER; provided, that CONTRACTOR shall not be liable to OWNER for failure to report any conflict, error or discrepancy in the Contract Documents unless CONTRACTOR had actual knowledge, or reasonably should have known, thereof.

Amending and Supplementing Contract Documents:

3.4 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.4.1 a Written Amendment,

3.4.2 a Change Order

3.4.3 a Work Directive Change

Contract Price and Contract Time may only be changed by a Change Order or a Written Amendment.

3.5 In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

3.5.1 a Field Order

3.5.2 ENGINEER's review of shop drawings or samples, or

3.5.3 ENGINEER's written interpretation or clarification.

Reuse of Documents:

3.6 Neither CONTRACTOR, nor any Subcontractor or Supplier or other person or organization performing any of the Work under a direct or indirect contract with OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER.

ARTICLE 4 ACCESS: PHYSICAL CONDITIONS: REFERENCE POINTS

Availability of Lands:

4.1 OWNER shall furnish CONTRACTOR with access, as indicated in the Contract Documents, to the land upon which the Work is to be performed. Any necessary easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents.

CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

Physical Conditions:

4.2 Reports, Review and Adjustments:

4.2.1 Explorations and Reports: Reference is made to the Supplementary Conditions for identification of those reports of explorations and tests of subsurface conditions utilized in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such reports, but not upon nontechnical data, interpretations or opinions contained therein or on the completeness thereof for CONTRACTOR's purposes. CONTRACTOR shall have full responsibility for subsurface conditions at the site.

4.2.2 Existing Structures: Reference is made to the Supplementary Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities referred to in paragraph 4.3) which are at or contiguous to the site that have been utilized in preparing the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such drawings, but not on the completeness thereof for CONTRACTOR's purposes. CONTRACTOR shall have full responsibility for physical conditions in or relating to such structures.

4.2.3 Report of Differing Conditions: If CONTRACTOR believes that:

4.2.3.1 any technical data on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is inaccurate in any material respect, or

4.2.3.2 any physical condition uncovered or revealed at the site differs materially from that indicated, reflected or referred to in the Contract Documents and that could not reasonably have been anticipated by CONTRACTOR, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.22), notify OWNER in writing within five (5) days about the inaccuracy or difference.

4.2.4 PROJECT MANAGER's Review: Upon receipt of such notice from CONTRACTOR, PROJECT MANAGER will promptly review with ENGINEER the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto and advise CONTRACTOR in writing of any findings and conclusions.

4.2.5 Possible Document Change: If PROJECT MANAGER concludes that, because of any such material inaccuracy or because of any such newly discovered conditions that differ materially from that indicated, reflected or referred to in the Contract Documents and that could not reasonably have been anticipated by CONTRACTOR, a change in the Contract Documents is required, a Work Directive Change or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such inaccuracy or differing conditions.

4.2.6 Possible Price and Time Adjustments: In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, will be allowable to the extent that these are attributable to any such material inaccuracy or difference.

Physical Conditions - Underground Facilities:

4.3 Underground Facilities:

4.3.1 Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site are based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others. Unless it is expressly provided otherwise in the Supplementary Conditions:

4.3.1.1 OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and,

4.3.1.2 CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Facilities shown or indicated in the Contract Documents, for coordination of the Work with the owners of such Underground Facilities during construction, for the safety and protection thereof as provided in paragraph 6.20 and for the repair of any damage thereto resulting from the Work, the cost of all of which will be considered as having been included in the Contract Price.

4.3.2 Not Shown or Indicated: If any Underground Facility is uncovered or revealed at or contiguous to the site that was not shown or indicated in the Contract Documents and that CONTRACTOR could not reasonably have suspected, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby identify the owner of such Underground Facility and give written notice thereof to that owner and to PROJECT MANAGER. PROJECT MANAGER will promptly review such Underground Facility to determine the extent to which the Contract Documents should be modified to reflect and document the consequences for the Work of such Underground Facility, and the Contract Documents will be amended or supplemented to the extent necessary. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that CONTRACTOR could not reasonably have suspected.

Reference Points:

4.4 OWNER shall provide engineering surveys to establish reference points for construction that, in ENGINEER's judgment, are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and reserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to OWNER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

ARTICLE 5 BONDS AND INSURANCE

Performance and Other Bonds:

5.1 CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect until at least one year after the date when final payment becomes due, except as otherwise provided by any Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the forms prescribed by any Laws or Regulations or by the Contract Documents and be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of its authority to act.

5.2 If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located, or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall, within five days thereafter, substitute another Bond and Surety, both of which must be acceptable to OWNER.

CONTRACTOR's Liability Insurance:

5.3 CONTRACTOR shall purchase and maintain such comprehensive general liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below that may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, by any subcontractor, by anyone directly or indirectly employed to perform any of the Work, or by anyone for whose acts any of them may be liable:

5.3.1 Claims under workers' or workmen's compensation, disability benefits and other similar employee benefit acts;

5.3.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR' employees;

5.3.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

5.3.4 Claims for damages insured by personal injury liability coverage that are sustained (a) by any person as a result of an occurrence directly or indirectly related to the employment of such person by CONTRACTOR, or (b) by any other person for any other reason;

5.3.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom;

5.3.6 Claims arising out of operation of Laws or Regulations for damages because of bodily injury or death of any person or for damage to property; and

5.3.7 Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle. The insurance required by this paragraph 5.3 shall include the coverage specified herein and shall be written for not less than the limits of liability and coverage provided in paragraph 5.3.8, or required by law, whichever is greater. The comprehensive general liability insurance shall include completed operations insurance. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded thereunder will not lapse or be canceled, materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and ENGINEER by certified mail. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR is correcting, removing or replacing defective WORK in accordance with paragraph 13.12. In addition, CONTRACTOR shall maintain such completed operations insurance for at least two years after final payment and furnish OWNER with evidence of continuation of such insurance at final payment and one year thereafter.

5.3.8 While performing the Work under this Agreement and until the CONTRACTOR has performed all Work to the satisfaction of the Owner, the CONTRACTOR shall provide and maintain, with forms and insurers acceptable to the Owner, the following insurance coverages:

a. Workers' Compensation Insurance to cover all obligations imposed by federal and state statutes and regulations having jurisdiction over any employees of the Consultant that are engaged in the performance of the Services and Employer's Liability Insurance with a policy coverage amount no less than minimum Statutory requirements for Workers' Compensation and no less than $1,000,000 for Employer's Liability Insurance;

b. Broad Form Commercial General Liability Insurance. The policy shall include coverage for bodily injury liability, including death, property damage liability, personal injury liability (including coverage for contractual and employee acts), and blanket contractual liability with a policy coverage amount no less than $2,000,000 combined single limits for each occurrence or in the aggregate. Said policy shall contain a severability of interest provision, but shall not be subject to any type of pollution or owned property exclusions; and

c. Comprehensive Automobile Liability Insurance with a policy coverage amount no less than $2,000,000, combined single limits for each occurrence or in the aggregate.

Before commencement of any of the Work hereunder, the CONTRACTOR agrees to furnish to the Owner, on an annual renewal basis, certificates of insurance or other evidence satisfactory to the Owner to the effect that such insurance has been procured and is in force. The certificates shall accurately reflect the required insurance coverages, including, any and all limitations, exclusions and restrictions, and (i) name the Owner and all of its subsidiaries and affiliates as additional insureds (except for coverage b. above), (ii) waive any rights of subrogation that the insurer could or may have against the Owner and all of its parent corporations, subsidiaries, and affiliates, and (iii) provide, in the event of cancellation or material change in a policy affecting the certificate holder, thirty (30) days prior written notice shall be given to the OWNER.

Contractual Liability Insurance:

5.4 The comprehensive general liability insurance required by paragraph 5.3 will include contractual liability insurance applicable to CONTRACTOR's obligations under paragraphs 6.30 and 6.31. Notwithstanding any of the provisions of the Contracxt documents with respect to insurance, the liability of the CONTRACTOR shall not be limited to the insurance coverage stipulated in this paragraph or in paragraph 5.3.

OWNER's Liability Insurance:

5.5 OWNER shall be responsible for purchasing and maintaining OWNER's own liability insurance and, at OWNER's option, may purchase and maintain such insurance as will protect OWNER against claims that may arise from operations under the Contract Documents.

Waiver of Rights:

5.6 All Risk Insurance:

5.6.1 OWNER and CONTRACTOR waive all rights against each other for all losses and damages caused by any of the perils covered by the policies of insurance required hereunder, and any other property insurance applicable to the Work, and also waive all such rights against the Subcontractors, ENGINEER, ENGINEEER's consultants and all other parties named as insureds in such policies for losses and damages so caused. As required by paragraph 6.11, each subcontract between CONTRACTOR and a Subcontractor will contain similar waivers by the Subcontractor in favor of OWNER, CONTRACTOR, ENGINEER, ENGINEEER's consultants and all other parties named as insureds.

5.6.2 OWNER and CONTRACTOR intend that any such policies shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that, in the event of payment of any loss or damage, the insurer will have no rights of recovery against any of the parties named as insureds. If the insurers require separate waiver forms to be signed by ENGINEER or ENGINEER's consultant, OWNER will obtain the same, and if such waiver forms are required of any Subcontractor, CONTRACTOR will obtain the same.

Receipt and Application of Proceeds:

5.7 Any insured loss under the policies of insurance required hereunder will be adjusted with OWNER and made payable to OWNER, subject to the requirements of any applicable mortgage clause and of paragraph 5.8. OWNER shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.8 OWNER shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing, within fifteen days after the occurrence of loss, to OWNER's exercise of this power. If any such objection is made, OWNER shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach.

Acceptance of Insurance:

5.9 If OWNER has any objection to the coverage afforded by, or other provisions of, the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.3 and 5.4 because it does not comply with the requirements of the Contract Documents, OWNER shall notify CONTRACTOR thereof in writing within twenty days after delivery of such certificates to OWNER in accordance with paragraph 2.7. Failure by OWNER to give any such notice of objection within such time shall constitute acceptance of such insurance as complying with the Contract Documents.

Partial Utilization - Property Insurance:

5.10 If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all of the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use or occupancy.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1 CONTRACTOR shall supervise and direct the Work competently, diligently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. CONTRACTOR shall be responsible for ensuring that the finished Work complies fully with the Contact Documents.

6.2 CONTRACTOR shall keep on the Work, at all times until completion thereof, a competent resident superintendent, who shall not be replaced without prior written notice to OWNER, except under extraordinary circumstances. Such superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials and Equipment:

6.3 CONTRACTOR shall provide competent, suitable qualified personnel to survey and lay out the Work and to perform construction as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site.

6.4 Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the performance, testing, start-up and completion of the Work. CONTRACTOR shall provide adequate sanitary facilities for the use of those employed on the Work, and the use thereof shall be strictly enforced. Such facilities shall be made available when the first employees arrive on the site and shall be removed after the departure of the last employees from the job.

6.5 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by OWNER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of all materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents.

Adjusting Progress Schedule:

6.6 CONTRACTOR shall submit to PROJECT MANAGER for acceptance (to the extent indicated in paragraph 2.9) adjustments in the progress schedule to reflect the impact thereon of any new developments; these adjustments will conform federally to the progress schedule then in effect and, in addition, will comply with any provisions of the General Requirements applicable thereto.

Substitutes or "Or-Equal" Items:

6.7 Substituted Items:

6.7.1 Whenever material or equipment are specified or described in the Contract Documents using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by ENGINEER if sufficient information is submitted to PROJECT MANAGER by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is at least equal to that named. The procedure for review by ENGINEER will include the following provisions as supplemented in the General Requirements. Requests for review of substitute items of material and equipment will not be accepted by PROJECT MANAGER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make written application to PROJECT MANAGER for acceptance thereof, certifying that the proposed substitute will perform fully the functions and achieve the results called for by the general design, be of at least equal substance to that specified and be suited to the same use as that specified. The application will state that the evaluation and acceptance of the proposed substitute will not

prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all cost that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other Contractors affected by the resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. PROJECT MANAGER may require CONTRACTOR to furnish, at CONTRACTOR's expense, additional data about the proposed substitute.

6.7.2 If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to ENGINEER. CONTRACTOR must first submit sufficient information to PROJECT MANAGER to allow ENGINEER to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in paragraph 6.7.1 as applied by ENGINEER and as may be supplemented in the General Requirements.

6.7.3 ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. ENGINEER will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance, which will be evidenced by either a Change Order or a reviewed Shop Drawing. OWNER may require CONTRACTOR to furnish, at CONTRACTOR's expense, a special performance guarantee or other surety with respect to any substitute. ENGINEER will record time required in evaluating substitutions proposed by CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not ENGINEER accepts any proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER for evaluating each proposed substitute.

Concerning Subcontractors, Suppliers and Others:

6.8 Subcontractors and Suppliers:

6.8.1 CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization against whom OWNER or ENGINEER may have any reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to perform any of the Work against whom CONTRACTOR has any reasonable objection.

6.8.2 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials and equipment) to be submitted to OWNER in advance of a specified date prior to the Effective Date for acceptance by OWNER and ENGINEER and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price will be adjusted by the difference in cost, if any, occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

6.9 CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or ENGINEER to pay, or to ensure the payment of, any moneys due any such Subcontractor, Supplier or other person or organization, except as may otherwise be required by Laws and Regulations.

6.10 The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.11 All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor that specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and contains waiver provisions as required by paragraph 5.8. CONTRACTOR shall pay each Subcontractor a just share of any insurance moneys received by CONTRACTOR on account of losses under policies issued pursuant to paragraphs 5.4 and 5.5.

Patent Fees and Royalties:

6.12 CONTRACTOR shall pay all license fees and royalties, and shall assume all costs, incident to the use in the performance of the Work, or the incorporation in the Work, of any invention, design, process, product or device that is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of OWNER, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. CONTRACTOR shall indemnify and hold harmless OWNER and anyone directly or indirectly employed by either of them, from and against all claims, demands, damages, losses, liabilities, suits, actions, causes of action, costs and expenses (including, without limitation, attorneys' fees and court and arbitration costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work, or resulting from the incorporation in the Work, of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

Permits:

6.13 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses in connection with the Work. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work that are applicable at the time of opening Bids or, if there are no Bids, on the Effective Date. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto.

Laws and Regulations:

6.14 Compliance:

6.14.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.14.2 If CONTRACTOR observes that the Specifications or Drawings are at variance with any Laws or Regulations, CONTRACTOR shall give PROJECT MANAGER prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 3.4. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, and without such notice to PROJECT MANAGER, CONTRACTOR shall bear all costs arising therefrom; provided that it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations.

6.14.3 CONTRACTOR shall keep itself fully informed of all Laws and Regulations in any manner affecting those engaged or employed in the Work, or the materials used in the Work, or in any way affecting the conduct of the Work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in the Contract, or in the drawings or specifications therein referred to, in relation to any such law, ordinance, regulation, order, or decree, CONTRACTOR shall forthwith report the same in writing to OWNER and ENGINEER. CONTRACTOR shall at all times observe and comply with all such existing and future Laws and Regulations and shall protect and indemnify OWNER and its agents against any

claim, demand, loss, liability, cost or expense, including, without limitation, attorneys' fees, arising from or based on the violation of any such Law or Regulation.

Taxes:

6.15 CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with Laws and Regulations of the place of the Project that are applicable during the performance of the Work.

Uses of Premises:

6.16 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-ways, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the Work. If any claim is made against OWNER by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold OWNER and anyone directly or indirectly employed by the OWNER harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action or suit, legal or equitable, brought by any such other party against OWNER and anyone directly or indirectly employed by the OWNER to the extent based on a claim arising out of CONTRACTOR's performance of the Work.

6.17 During the progress of the Work, CONTRACTOR shall keep the premises free from waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.18 CONTRACTOR shall not load any structure, or permit any part of any structure to be loaded, in any manner that will endanger such structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

Record Documents:

6.19 CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Directive Changes, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents, together with all approved samples and a counterpart of all reviewed Shop Drawings, will be available to PROJECT MANAGER for reference. Upon completion of the Work, these record documents, samples and Shop Drawings will be delivered to PROJECT MANAGER.

Safety and Protection:

6.20 CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall develop a health and safety plan and shall submit such plan to PROJECT MANAGER. Such plan must, at a minimum, meet requirements as described in the OWNER's Safety Manual, a copy of which is available from the PROJECT MANAGER upon request, and must be acceptable to PROJECT MANAGER and must satisfy all laws and regulations that govern the Work. CONTRACTOR must sign a "Contractor's Safety Statement", which is available form the PROJECT MANAGER, before beginning any Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1 all employees on the Work and other persons and organizations who may be affected thereby:

6.20.2 all of the Work, and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.20.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavement, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

CONTRACTOR shall comply with all Laws and Regulations for the safety of persons or property or to protect them from damage, injury or loss, and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work might affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, any Supplier or any other person or organization directly or indirectly employed by any of the them to anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall be complete when ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.21 CONTRACTOR shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to OWNER.

Emergencies:

6.22 In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization PROJECT MANAGER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give PROJECT MANAGER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If PROJECT MANAGER determines that any such changes or variations are required because of such emergency, a Directive Change or Change Order will be issued to document them.

Shop Drawings and Samples:

6.23 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, CONTRACTOR shall submit to PROJECT MANAGER for review in accordance with the accepted schedule of Shop Drawing submissions (see paragraph 2.9), or for other appropriate action if so indicated in the Supplementary Conditions, three copies plus the number of copies required by CONTRACTOR (unless otherwise specified in the General Requirements) of all Shop Drawings, which will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of such submission. All submissions will be identified as PROJECT MANAGER may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable ENGINEER to review such information as required.

6.24 CONTRACTOR shall also submit to PROJECT MANAGER for review, as promptly as necessary to prevent delay in the Work, all samples required by the Contract Documents. All samples will have been checked by CONTRACTOR and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of such submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

6.25 Submissions:

6.25.1 Before submission of each Shop Drawing or sample CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and shall have reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.

6.25.2 At the time of each such submission, CONTRACTOR shall give PROJECT MANAGER specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the

Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to PROJECT MANAGER for review of each such variation.

6.26 ENGINEER will review with reasonable promptness Shop Drawings and samples, but ENGINEER's review will be limited to a determination of whether such submissions conform with the design concept of the Project and with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto;. The review of a separate item, as such, will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submissions.

6.27 ENGINEER's review of Shop Drawings or samples shall not relieve CONTRACTOR of its responsibility for any variation from the requirements of the Contract Document unless CONTRACTOR, in writing, has called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.25.2, and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval. Nor will any review by ENGINEER relieve CONTRACTOR of its responsibility for compliance with the provisions of paragraph 6.25.1.

6.28 Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to ENGINEER's review of the pertinent submission will be the sole responsibility, and shall be at the sole cost and expense, of CONTRACTOR.

Continuing the Work:

6.29 CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as CONTRACTOR and OWNER may otherwise agree in writing.

Indemnification:

6.30 To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER and its respective consultants, agents, officers, directors and employees from and against any and all claims, demands, damages, losses, liabilities, suits, actions, causes of action, costs and expenses, direct, indirect or consequential (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) arising out of the Work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or the injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom and (b) is caused, in whole or in part, by any act or omission of CONTRACTOR, any Subcontractor, any person or organization directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder or arises under or is imposed by Laws and Regulations, regardless of the negligence of any such party. Notwithstanding any provisions hereof to the contrary, CONTRACTOR shall indemnify and hold OWNER harmless from and against all claims, demands, damages, losses, liabilities, suits, actions, causes of action, costs and expenses, direct, indirect or consequential, resulting from injury, sickness or death sustained by CONTRACTOR, CONTRACTOR's employees, Subcontractor, or any person or organization directly or indirectly employed by any of them, while performing the Work.

6.31 In any and all claims against OWNER or any of its consultants, agents, officers, directors, or employees by any employee of CONTRACTOR, any Subcontractor, any person or organization directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.30 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor or other person or organization under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

6.32 The obligations of CONTRACTOR under paragraph 6.30 shall not extend to the liability of ENGINEER, ENGINEER's consultants, agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications.

ARTICLE 7 OTHER WORK

Related Work at Site:

7.1 OWNER may perform other work related to the Project at the site by OWNER's own forces, or let other direct contracts therefor with utility owners or other contractors that contain General Conditions similar or dissimilar to these.

7.2 CONTRACTOR shall afford each such utility owner and other contractor (or OWNER, if OWNER is performing the additional work with OWNER's employees) reasonable access to the site and a reasonable opportunity for the introduction and storage of materials and equipment thereon and the execution of such work, and shall properly connect and coordinate the Work with theirs. CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of PROJECT MANAGER and the others whose work will be affected.

7.3 If any part of the Work depends for proper execution or results upon the work of any such other contractor or utility owner (or OWNER), CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution or results. CONTRACTOR's failure so to report will constitute an acceptance of the other work as fit and proper for integration with the Work, except for latent or other defects and deficiencies that are not apparent in the other work.

Coordination:

7.4 If OWNER contracts with others for the performance of other work on the Project, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified in the Supplementary Conditions, and the specific matters to be covered by such authority and responsibility will be itemized, and the extent of such authority and responsibilities will be provided, therein. Except as otherwise provided in the Supplementary Conditions, PROJECT MANAGER shall not have any authority or responsibility for such coordination.

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.1 OWNER shall issue all communications to CONTRACTOR through PROJECT MANAGER.

8.2 OWNER shall promptly furnish the data required of OWNER under the Contract Documents and shall make payments to CONTRACTOR when due as provided in paragraphs 14.4 and 14.13.

ARTICLE 9 PROJECT MANAGER'S AND ENGINEER'S STATUS DURING CONSTRUCTION

OWNER's Representative:

9.1 PROJECT MANAGER will be OWNER's representative during the construction period.

Visits to Site:

9.2 PROJECT MANAGER will make or direct ENGINEER to make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. PROJECT MANAGER or ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work, except as directed by OWNER. PROJECT MANAGER's and ENGINEEER's efforts will be directed toward providing for

OWNER a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations, ENGINEER and PROJECT MANAGER will keep OWNER informed of the progress of the WORK and will endeavor to guard OWNER against defects and deficiencies in the WORK.

Clarifications and Interpretations:

9.3 ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as PROJECT MANAGER determines is necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

Authorization of Variations in Work:

9.4 PROJECT MANAGER may authorize minor variations in the Work from the requirements of the Contract Documents that do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and CONTRACTOR, who shall perform the corresponding Work promptly.

Rejecting Defective Work:

9.5 PROJECT MANAGER will have the authority to disapprove or reject Work that ENGINEER believes to be defective, and will also have the authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Determinations for Unit Prices:

9.6 PROJECT MANAGER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. PROJECT MANAGER will review with CONTRACTOR the PROJECT MANAGER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). PROJECT MANAGER's written decisions thereon will be final and binding upon OWNER and CONTRACTOR unless, within ten days after the date of any such decision, either OWNER or CONTRACTOR delivers to the other party, and to PROJECT MANAGER, written notice of intention to appeal such decision.

Decisions on Disputes:

9.7 PROJECT MANAGER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Time, will be referred initially to PROJECT MANAGER in writing with a request for a formal decision in accordance with this paragraph, which PROJECT MANAGER will render in writing within a reasonable time.

Limitations on PROJECT MANAGER's and ENGINEEER's Responsibilities:

9.8 Neither PROJECT MANAGER nor ENGINEER shall supervise or direct the performance of the Work, contrary to the provisions of paragraphs 9.9 or 9.10.

9.9 Neither PROJECT MANAGER nor ENGINEER will be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

9.10 Neither PROJECT MANAGER nor ENGINEER will be responsible for the acts or omissions of CONTRACTOR, or of any Subcontractor, any Supplier, or of any other person or organization performing any of the Work.

ARTICLE 10 CHANGES IN THE WORK

10.1 Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; which will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work (as affected thereby), which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided therein).

10.2 If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be allowed as a result of a Work Directive Change, a claim may be made therefor as provided in Article 11 or Article 12.

10.3 CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents, as amended, modified and supplemented as provided in paragraph 6.22.

10.4 OWNER and CONTRACTOR shall execute appropriate Change Orders (or Written Amendments) covering:

10.4.1 changes in the Work that are ordered by OWNER pursuant to paragraph 10.1, are required because of acceptance of defective Work under paragraph 13.14, or are agreed to by the parties;

10.4.2 changes in the Contract Price or Contract Time that are agreed to by the parties and

10.4.3 changes in the Contract Price or Contract time that embody the substance of any written decision rendered by PROJECT MANAGER pursuant to paragraph 9.7.

10.5 If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, the Contract Price or the Contract Time) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR in connection with the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at its expense, without any change in the Contract Price.

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by the claimant to the other party and to PROJECT MANAGER promptly (but in no event later than five [5] days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Written supporting data will be submitted by the claimant to PROJECT MANAGER and the other party within ten (10) days after such occurrence (unless PROJECT MANAGER allows an additional period of time to obtain more accurate data as to such claim) and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of such event. All claims for adjustment in the Contract Price shall be determined by PROJECT MANAGER, if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph.

11.3 The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

11.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.

11.3.2 By mutual acceptance of a lump sum.

11.4 Unit Price Work:

11.4.1 Where the Contract Documents provide that all or part of the WORK is to be Unit Price Work, the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item as indicated in the Proposal. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by PROJECT MANAGER.

11.4.2 Each such unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

ARTICLE 12 CHANGE OF CONTRACT TIME

12.1 The Contract Time may be changed only by a Change Order or a Written Amendment. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party and to PROJECT MANAGER promptly (but in no event later than five [5] days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim, with supporting data, shall be delivered within ten (10) days after such occurrence (unless PROJECT MANAGER allows an additional period of time to obtain more accurate data as to such claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of such event. All claims for adjustment in the Contract Time shall be determined by PROJECT MANAGER if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the CONTRACT Time will be valid if not submitted in accordance with the requirements of this paragraph.

12.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of CONTRACTOR (or a subcontractor or supplier) if a claim is made therefor as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts of neglect by OWNER or others performing additional work as contemplated by Article 7, or to fires, floods, labor disputes, epidemics, abnormal weather conditions or acts of God.

12.3 All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article 12 shall not exclude recovery for damages (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) for delay by either party.

ARTICLE 13 WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

Warranty and Guarantee:

13.1 CONTRACTOR warrants and guarantees to OWNER that all Work will be in accordance with the Contract Documents and will not be defective. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2 PROJECT MANAGER's representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for observation, inspection and testing. CONTRACTOR shall provide proper and safe conditions for such access.

Tests and Inspections:

13.3 CONTRACTOR shall give PROJECT MANAGER timely notice when the Work is ready for all required inspections, tests and approvals.

13.4 If Laws or Regulations require any Work (or part thereof) to be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish PROJECT MANAGER with the required certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER's or PROJECT MANAGER's acceptance of materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. The costs of all inspections, tests and approvals in addition to the above which are required by the Contract Documents shall be paid by OWNER (unless otherwise specified).

13.5 No inspections, tests or approvals by others shall relieve CONTRACTOR of its obligations to perform the Work in accordance with the Contract Documents.

Uncovering Work:

13.6 If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of PROJECT MANAGER, it must, if requested by PROJECT MANAGER, be uncovered for observation. Such uncovering shall be at CONTRACTOR's expense.

13.7 If any Work is covered contrary to the written request of PROJECT MANAGER, it must, if requested by PROJECT MANAGER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

OWNER May Stop the Work:

13.8 If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents. OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; provided that such right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise such right for the benefit of CONTRACTOR or any other party.

Correction or Removal of Defective Work:

13.9 If required by PROJECT MANAGER, CONTRACTOR shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with non-defective Work. CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

One-Year Correction Period:

13.10 If, within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provisions of the Contract Documents, any Work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions, either correct such defective Work or, if it has been rejected by OWNER, remove it from the site and replace it with non-defective Work. If CONTRACTOR does not promptly comply with the terms of such instruction, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such correction, removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all Work, the correction period for the item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

Acceptance of Defective Work:

13.11 If, instead of requiring correction or removal and replacement of defective Work, OWNER prefers to accept it, OWNER may do so. CONTRACTOR shall bear all direct, indirect and consequential costs attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by PROJECT MANAGER as to reasonableness and to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). If any such acceptance occurs prior to PROJECT MANAGER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.12 If CONTRACTOR fails within a reasonable time after written notice from PROJECT MANAGER to correct defective Work or to remove and replace rejected Work as required by PROJECT MANAGER in accordance with paragraph 13.11, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days'

written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees such access to the site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of OWNER in exercising such rights and remedies under this paragraph will be charged against CONTRACTOR in an amount approved as to reasonableness by PROJECT MANAGER, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in Article 11. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

Protection of the Work:

13.13 CONTRACTOR shall take all necessary precautions to ensure the safety of, and shall provide such protection as is necessary to prevent damage, injury or loss to, (a) the WORK and all equipment and materials to be incorporated therein, including any materials and equipment stored on or off site, and (b) the property at the site or adjacent thereto, including trees, bushes, shrubs, lawns, walkways, roadways, paved areas, and structures not designated for relocation, replacement or removal in the course of construction.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1 The schedule of values established as part of the Agreement will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to PROJECT MANAGER. Progress payments on account of Unit Price Work will be based on the number of units completed, as measured by the PROJECT MANAGER.

Application for Progress Payment:

14.2 At least sixty (60) days before each progress payment is scheduled (but not more often than once a month and no later than the 25 day of any month), CONTRACTOR shall submit to PROJECT MANAGER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is required on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which will be satisfactory to OWNER.

14.3 OWNER shall pay CONTRACTOR an amount equal to ninety percent (90%) of the proportional amount of the Work that, to OWNER's knowledge, information and belief has been completed in accordance with the Contract Documents, the remaining ten percent (10%) of such proportional amount constituting retainage. CONTRACTOR shall promptly pay each subcontractor, and shall require each subcontractor to make payments to its

subcontractors in a similar manner. Upon Substantial Completion of the Work, all amounts retained shall be paid to CONTRACTOR, except for an amount equal to 150% of the cost estimated by ENGINEER to fully complete the Work.

14.4 With each Application for Payment, CONTRACTOR shall submit a certification by an officer of CONTRACTOR stating that:

There are no known mechanic's, materialmen's or laborer's liens or claims or any other liens or claims, legal or equitable, contractual, statutory or constitutional, outstanding or known to exist at the date of this Application; all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current Application and there is no known basis for the filing of any mechanic's, materialmen's or laborer's lien or claim or any other lien or claim, legal or equitable, contractual, statutory or constitutional, with respect to the Work; and waivers and releases from all Subcontractors, laborers and materialmen for Work done and materials furnished have been obtained in such form as to constitute an effective waiver and release of all such liens and claims under the laws of the state in which the Project is located and shall be delivered to ENGINEER together with CONTRACTOR's waiver and release of liens and claims at the time of submission of the Application for Payment. In conjunction with each Application for Payment, CONTRACTOR also shall submit such Lien waivers and related documents as OWNER's, or its lender's, title insurer may require.

CONTRACTOR's Warranty of Title:

14.5 CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by an Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

Review of Application for Progress Payment:

14.6 PROJECT MANAGER will either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing PROJECT MANAGER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application. Sixty (60) days after presentation of the Application for Payment with PROJECT MANAGER's recommendation of payment, the amount recommended will become due and payable by OWNER to CONTRACTOR.

14.7 PROJECT MANAGER's recommendation of any payment requested in an Application for Payment will constitute a representation by PROJECT MANAGER to OWNER, based on PROJECT MANAGER's onsite observations of the Work in progress and on PROJECT MANAGER's review of such Application for Payment and the accompanying, documents, data and schedules that the Work has progressed to the point indicated; that, to the best of PROJECT MANAGER's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.6, and to any other qualifications stated in PROJECT MANAGER's recommendation); and that CONTRACTOR is entitled to payment of the amount recommended. However, by recommending any such payment, PROJECT MANAGER will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to PROJECT MANAGER in the Contract Documents or that there may not be other matters or issues between the parties that might entitle (a) CONTRACTOR to additional payment by OWNER or (b) OWNER to withhold payment to CONTRACTOR.

14.8 PROJECT MANAGER's recommendation of final payment will constitute an additional representation by PROJECT MANAGER to OWNER that the conditions precedent to final payment have been satisfied.

14.9 PROJECT MANAGER may refuse to recommend the whole or any part of any payment if, in PROJECT MANAGER's opinion, it would be incorrect to make such representations to OWNER. PROJECT MANAGER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary, in PROJECT MANAGER's opinion, to protect OWNER from loss because:

14.9.1 the Work is defective, or completed Work has been damaged requiring correction or replacement,

14.9.2 the Contract Price has been reduced by Written Amendment or Change Order.

14.9.3 OWNER has corrected defective Work or completed Work in accordance with paragraph 13.12, or

14.9.4 Of ENGINEEER's actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.9 inclusive.

OWNER may refuse to make payment of the full amount recommended by PROJECT MANAGER because claims have been made against OWNER on account of CONTRACTOR's performance of the Work or Liens have been filed in connection with the Work or there are other items entitling OWNER to a set-off against the amount recommended, but OWNER must give CONTRACTOR prompt written notice stating the reasons for such refusal.

Substantial Completion:

14.10 When CONTRACTOR considers the entire Work ready for its intended use, CONTRACTOR shall notify OWNER and PROJECT MANAGER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that PROJECT MANAGER issue a certificate of Substantial Completion. Within a reasonable time thereafter, PROJECT MANAGER, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, PROJECT MANAGER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work Substantially complete, ENGINEER will prepare and deliver to PROJECT MANAGER a tentative certificate of Substantial Completion, which shall specify the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. PROJECT MANAGER shall have fourteen (14) days after receipt of such tentative certificate during which to object to ENGINEER in writing as to any provisions of such certificate or attached list. If, after considering such objections, ENGINEER does not consider the Work substantially complete, PROJECT MANAGER will notify CONTRACTOR thereof in writing, stating the reasons therefor. If, after considering such objections, ENGINEER considers the Work substantially complete, ENGINEER will, within such fourteen day period, execute and deliver to PROJECT MANAGER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified, after consideration of any objections by PROJECT MANAGER. At the time of delivery of the tentative certificate of Substantial Completion, ENGINEER will deliver to PROJECT MANAGER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties. Unless PROJECT MANAGER and CONTRACTOR agree otherwise in writing and so inform ENGINEER prior to the issuance of the definitive certificate of Substantial Completion, ENGINEER's recommendation as aforesaid will be binding on OWNER and CONTRACTOR until final payment.

14.11 OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

Partial Utilization:

14.12 Use by OWNER of any finished part of the Work, which has specifically been identified in the Contract Documents, or which PROJECT MANAGER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work, subject to the following:

14.12.1 OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER and that OWNER may use such part of the Work. CONTRACTOR at any time may notify OWNER, PROJECT MANAGER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete. Within a

reasonable time after either such request, PROJECT MANAGER, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify PROJECT MANAGER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.10 and 14.11 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

14.12.2 OWNER may at any time request in writing that CONTRACTOR permit OWNER to take over operation of any such part of the Work although it is not substantially complete. A copy of such request will be sent to PROJECT MANAGER, and, within a reasonable time thereafter, PROJECT MANAGER, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in writing to PROJECT MANAGER and ENGINEER that such part of the Work is not ready for separate operation by OWNER, ENGINEER will finalize the list of items to be completed or corrected and will deliver such list to PROJECT MANAGER and CONTRACTOR, together with a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Work which will become binding upon OWNER and CONTRACTOR at the time that OWNER takes over such operation (unless they shall have otherwise agreed in writing and so informed ENGINEER). During such operation and prior to Substantial Completion of such part of the Work, OWNER shall allow CONTRACTOR reasonable access to complete or correct items on such list and to complete other related Work.

14.12.3 No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.8 in respect of property insurance.

Final Inspection:

14.13 Upon written notice from CONTRACTOR that the entire Work, or an agreed portion thereof, is complete, PROJECT MANAGER and ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which such inspection revealed that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies.

Final Application for Payment:

14.14 After CONTRACTOR has remedied all such deficiencies to the satisfaction of PROJECT MANAGER and ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents and other documents - all as required by the Contract Documents, and after PROJECT MANAGER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.17), CONTRACTOR may apply for final payment following the same procedure as is used for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to OWNER and its title insurer) of all Liens arising out of or filed in connection with the Work (in accordance with paragraph 14.4). In lieu thereof, but subject to approval by OWNER and its title insurer, in their discretion, CONTRACTOR may furnish, receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, materials and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible, have been paid or otherwise satisfied; and consent of the surety, if any Subcontractor or Supplier fails to furnish a release or receipt in full.

Final Payment and Acceptance:

14.15 If, on the basis of PROJECT MANAGER's and ENGINEER's observation of the Work during construction and final inspection, and PROJECT MANAGER's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, PROJECT MANAGER and ENGINEER are satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been satisfied, PROJECT MANAGER will, within ten (10) days after receipt of the final Application

for Payment, indicate in writing PROJECT MANAGER's recommendation of payment and present such Application to OWNER for payment. Thereupon PROJECT MANAGER will give written notice to OWNER and CONTRACTOR that the Work is acceptable, subject to the provisions of paragraph 14.17. Otherwise, PROJECT MANAGER will return such Application to CONTRACTOR, indicating in writing the reasons for its refusal to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. Thirty (30) days after presentation to OWNER of the Application and accompanying documentation, in appropriate form and substance, and with PROJECT MANAGER's recommendation of payment and notice of acceptability, the amount recommended by PROJECT MANAGER will become due and payable by OWNER to CONTRACTOR.

CONTRACTOR's Continuing Obligation:

14.16 CONTRACTOR's obligations to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by PROJECT MANAGER, nor the issuance of any certificate of Substantial Completion, whether tentative, definitive or otherwise, nor any payments by OWNER to CONTRACTOR under the Contract Documents, nor any use or occupancy of the Work by OWNER nor any failure to do so, nor any review of Shop Drawings or sample submissions, nor any correction of defective Work by OWNER will constitute an acceptance of Work not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents.

Waiver of Claims:

14.17 The making and acceptance of final payment will constitute:

14.17.1 a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from defective Work or from failure to comply with the Contract Documents or the terms of any warranties or special guarantees specified therein; however, it will not constitute a waiver by OWNER of any rights in respect of CONTRACTOR's continuing obligations under the Contract Documents; and

14.17.2 a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

OWNER May Suspend Work:

15.1 OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR, which notice will fix the date on which the Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed.

OWNER May Terminate:

15.2 Upon the occurrence of any one or more of the following events:

15.2.1 if CONTRACTOR commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if CONTRACTOR takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to bankruptcy or insolvency;

15.2.2 if a petition is filed against CONTRACTOR under any chapter of the Bankruptcy Code, as now or hereafter in effect, or if a petition is filed seeking any such equivalent or similar relief against CONTRACTOR under any other federal or state law in effect at such time relating to bankruptcy or insolvency;

15.2.3 if CONTRACTOR makes a general assignment for the benefit of creditors;

15.2.4 if a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of property of CONTRACTOR is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of CONTRACTOR's creditors;

15.2.5 If CONTRACTOR admits in writing its inability to pay its debts generally as they become due;

15.2.6 if CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.9, as revised from time to time);

15.2.7 if CONTRACTOR fails to comply with Laws and Regulations of any public body having jurisdiction; or

15.2.8 if CONTRACTOR disregards the authority of, or fails to comply with the directions or orders of, PROJECT MANAGER; OWNER may, after giving CONTRACTOR (and the surety, if any) written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site (or which are stored elsewhere), and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs of completing the Work (including, but not limited to, fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) such excess will not be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such costs incurred by OWNER will be approved as to reasonableness by PROJECT MANAGER and incorporated in a Change Order, but when exercising any rights or remedies under this paragraph, OWNER shall not be required to obtain the lowest price for the Work performed.

15.3 Where CONTRACTOR's services have been so terminated by OWNER, such termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.4 Upon seven days' written notice to CONTRACTOR, OWNER may, without cause and without prejudice to any other right or remedy that it may have, elect to abandon the Work and terminate the Agreement. In such case, CONTRACTOR shall be paid for all Work executed and any expense sustained in connection therewith, plus reasonable termination expenses, as determined by PROJECT MANAGER.

CONTRACTOR May Stop Work or Terminate:

15.5 If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, then CONTRACTOR may, upon seven days' written notice to OWNER terminate the Agreement and recover from OWNER payment for all Work executed and any expense sustained in connection therewith, plus reasonable termination expenses, as determined by PROJECT MANAGER. The provisions of this paragraph shall not relieve CONTRACTOR of the obligations to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with OWNER.

ARTICLE 16 MISCELLANEOUS

Giving Notice:

16.1 [INTENTIONALLY OMITTED]

Computation of Time:

16.2 Time:

16.2.1 When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of such period falls on a Saturday or Sunday or on a day that is a legal holiday under the law of the applicable jurisdiction, such day will be omitted from the computation.

16.2.2 A calendar day of twenty-four hours measured from midnight to the midnight shall constitute a day.

General:

16.3 If OWNER or CONTRACTOR suffers injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, a claim therefor will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, any applicable statute of limitations or repose.

16.4 The duties and obligations imposed by these General Conditions, and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.30, 13.1, 13.11, 13.12, 14.5 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER thereunder, are in addition to, and are not to be construed as a limitation of, any rights and remedies available to any or all of them which are otherwise available at law or in equity, or are provided by special warranty or guarantee or by other provisions of the Contract Documents. All representations, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of the Agreement.

16.5 CONTRACTOR shall conduct all operations in connection with the Work so as to minimize, to the greatest extent possible, adverse environmental impact.

a. Noise: All equipment and machinery shall have exhaust mufflers maintained in good working order so as to reduce operating noise to minimum levels.

b. Dust/Smoke: All equipment movement shall be accompanied by a minimum of dust. Traveled surfaces and earthwork shall be maintained in a moist condition to avoid the generation of dust or the airborne movement of particulate matter under all prevailing atmospheric conditions. Burning operations will be conducted only with written permission of the OWNER and with all applicable governmental and quasi-governmental licenses, permits and approvals. CONTRACTOR shall be responsible for obtaining all such licenses, permits and approvals and shall comply with all statutes, laws, codes, ordinances and regulations pertaining to such burning.

c. Traffic: Trucks shall be routed over roads so as to result in the least effect on traffic and nuisance to the public. All material shall be loaded in a manner that will preclude the loss of any portion of the load in transit, including covering, if necessary.

d. Sedimentation: All points of concentrated rainfall runoff shall be monitored to ensure that no eroded material from the construction site is deposited off-site. CONTRACTOR shall take all measures necessary to promptly eliminate any off-site deposit of eroded material, including, without limitation, the installation of sedimentation basins.

e. Fuel and Lubricant Spills: All fuel, lubricant and other spills shall be removed from the site immediately by CONTRACTOR. No residue from any such spill shall remain on site.

16.6 CONTRACTOR shall protect from injury or damage and maintain in service all utility facilities, including, without limitation, sewer, water and electric lines, encountered in the performance of the Work until moved or replaced as required under the Contract Documents, or abandoned as may be necessary for the proper construction and use of the Work.

16.7 CONTRACTOR shall maintain the Work from the beginning of construction operations until final acceptance. This maintenance shall constitute continuous and effective Work prosecuted daily with adequate equipment and forces so that the site and structures thereon are kept in satisfactory condition at all times.

16.8 CONTRACTOR shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the Work and the safety of the public. CONTRACTOR shall provide suitable warning signs to properly control and direct traffic. CONTRACTOR shall furnish, install, and maintain all necessary barricades, warning signs, and other protection devices in accordance with the requirements of the state in which the Project is located. Temporary signs may be reused, provided that they are in good condition and legible. All protective devices shall be kept by CONTRACTOR in good, legible condition. The cost of furnishing, erecting, maintaining, and removing protective devices will be paid by CONTRACTOR. Where CONTRACTOR is required to perform any of these functions, the cost thereof shall be included in the overall Bid submitted. Ownership of such temporary warning devices shall remain with CONTRACTOR.

16.9 CONTRACTOR shall provide access for inspection by representatives of all applicable federal, state and local authorities.

16.10 All chemicals used by CONTRACTOR during the Work or furnished by CONTRACTOR for Project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or other classification, must have been approved for such use by either EPA or USDA, as applicable. Use of all such chemicals, and disposal of residues thereof, by CONTRACTOR shall be in conformance with Laws and Regulations and applicable instructions.

16.11 All materials delivered to the Project must be unloaded, stockpiled, and maintained by CONTRACTOR until used.

16.12 CONTRACTOR shall remove from the site, and from all neighboring public and private property, at its own expense, all temporary structures, signs, rubbish, and waste material, including, without limitation, excess excavated materials, resulting from its operations.

16.13 Each of the OWNER and the CONTRACTOR irrevocably waives any right to a trial by jury in any legal proceedings, or to have a jury participate in resolving any disputes or claims, whether any such proceedings, disputes or claims relate to or arise in contract, tort or otherwise, whether with respect to the Contract or any other documents or instruments delivered in connection with the Contract or the transactions contemplated thereby. If any word, phrase, sentence, clause, section, subsection or provision of the Contract as applied to any party or circumstance is adjudged by a court to be invalid or unenforceable, the same will in no way affect any other circumstance or the validity or enforceability of any other word, phrase, sentence, clause, section, subsection or provision of the Contract.

16.14 The Contract contains the entire understanding of the parties in respect of its subject matter and supersedes all prior agreements and understandings (oral or written) between or among the parties with respect to such subject matter. The Contract is not intended to, nor shall it, confer upon any third party, other than OWNER and CONTRACTOR, any rights or remedies hereunder.

16.15 No failure to exercise, and no delay in exercising, any right, power or privilege under the Contract shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege thereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing between the parties. No extension of any time for performance of any obligations or other acts thereunder or under any other agreement shall be deemed to be an extension of the time for performance of any other obligations or any other acts. The rights and remedies of the OWNER and the CONTRACTOR under the Contract are in addition to all other rights and remedies, at law or in equity, that they may have against each other.

16.16 The rights and obligations under the Contract shall bind and inure to the benefit of the OWNER and the CONTRACTOR and their respective successors and assigns. Nothing expressed or implied herein shall be construed to give any other person any legal or equitable rights hereunder. As the OWNER has entered into the Contract in order to receive the services and expertise of the CONTRACTOR, the CONTRACTOR cannot assign or delegate all or any portion of its rights and obligations under the Contract (by operation of law or otherwise) without the prior written consent of the OWNER, in its sole and absolute discretion.

16.17 The parties have jointly participated in the negotiation and drafting of the Contract. If any ambiguity or question of intent or interpretation arises, the Contract shall be construed as if drafted jointly by the parties, and no presumptions or burdens of proof shall arise favoring any party by virtue of the authorship of any of the provisions of the Contract. Any reference to any federal, state, local, or foreign statute or law shall be deemed also to refer to all rules and regulations promulgated thereunder, unless the context requires otherwise.

EXHIBIT "E"

SUPPLEMENTARY CONDITIONS

THESE SUPPLEMENTARY CONDITIONS ARE ATTACHED AS EXHIBIT "E" TO AN AGREEMENT (THE "AGREEMENT") BETWEEN OWNER AND CONTRACTOR. CAPITALIZED TERMS USED, BUT NOT OTHERWISE DEFINED, HEREIN SHALL HAVE THE MEANINGS GIVEN TO SUCH TERMS IN THE GENERAL CONDITIONS (THE "GENERAL CONDITIONS") ATTACHED AS EXHIBIT "D" TO THE AGREEMENT.

1. THE GENERAL CONDITIONS: The General Conditions shall apply to all Work as set forth in the Contract Documents, except as otherwise specified in these Supplementary Conditions. Requirements of these Supplementary Conditions supersede those of the General Conditions.

2. CONSTRUCTION DRAWINGS: The Work shall conform to the following construction drawings:

Sheet No.	Description
-	Title Sheet
1	Existing Topographic Survey
2	Construction Stakeout Plan
3	Top of Clay Liner Grades
4	Leachate Collection Plan
5	Erosion Control Plan
6 - 8	General Construction Details

3. REPORTS AND DRAWINGS USED BY ENGINEER: In the preparation of Drawings and Specifications, ENGINEER has relied upon:

   A. The following reports of explorations and tests of subsurface conditions at the site of the Work:
   (1): None

   B. The following drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are contiguous to the site of the Work:
   (1): Project Plans

4. EXTENSION OF TIME AND PROJECT SCHEDULE: Any and all extensions of time shall be in accordance with the General Conditions, except as otherwise hereinafter provided. A

project schedule shall be supplied at notice-to-proceed and shall be updated twice monthly throughout construction.

5. LIQUIDATED DAMAGES: If the Project is not completed on or before the Scheduled Completion Date, the CONTRACTOR shall pay to the OWNER, as liquidated damages, the sum of $2,000.00 per day until the Project is complete. As OWNER'S actual damages if the Project is not completed on or before the Scheduled Completion Date would be difficult, if not impossible, to determine, such liquidated damage amount represents the parties' best estimate of the amount of the damages that the OWNER would suffer in such a circumstance. The OWNER shall have the right to deduct and withhold the amount of any and all such damages from any monies owing by it to the CONTRACTOR or the OWNER may recover such amount from the CONTRACTOR and the sureties on its bond; all of such remedies shall be cumulative, and the OWNER shall not be required to elect any one remedy nor be deemed to have made an election by proceeding to enforce any one remedy.

6. IDENTITY OF SUBCONTRACTORS: Specify here whether CONTRACTOR must identify the Subcontractors, Suppliers, and other persons and organizations that it will use in the performance of the Work, and, if so, the date by which such identification must be submitted to OWNER

_____

_____

_____

_____

_____

_____

7. SANITARY CONVENIENCES: The CONTRACTOR shall provide adequate sanitary conveniences for use of those employed on the work and their use shall be strictly enforced. Such conveniences shall be made available when the first employees arrive on the site and shall be removed after the departure of the last employees from the job.

8. UTILITY SERVICE: The CONTRACTOR will arrange for temporary electrical service through the local agency at his own expense if CONTRACTOR desires electrical power on-site.

9. ENVIRONMENTAL IMPACT: The CONTRACTOR shall conduct all operations so as to minimize, to the greatest extent possible, adverse environmental impact.

   a. Noise: All equipment and machinery shall be provided with exhaust mufflers maintained in good working order so as to reduce operating noise to minimum levels.

   b. Dust/Smoke: All equipment movements shall be accompanied by a minimum of dust. Traveled surfaces and earthwork shall be maintained in a moist condition to avoid the generation of dust or the airborne movement of particulate matter under all prevailing atmospheric conditions.

Burning operations will be conducted only with written permission of the OWNER and/or appropriate regulatory agency. The CONTRACTOR shall be responsible for obtaining all permits and comply with all codes, ordinances and regulations pertaining to the burning.

c. Traffic: Trucks shall be routed over roads which will result in the least effect on traffic and nuisance to the public. All material shall be loaded in a manner which will preclude the loss of any portion of the load in transit, including covering, if necessary.

d. Sedimentation: All points of concentrated runoff from rainfall shall be visually monitored to determine that no eroded material from the construction site is being deposited off-site. Measures shall be taken to promptly eliminate such a deposition if occurring, including the installation of sedimentation basins.

e. Fuel and Lubricant Spills: All spills shall be removed from the site immediately by the CONTRACTOR. No residue from the spill shall remain on site.

10. ADJUSTMENT OF DISCREPANCIES: In all cases of discrepancies between the various dimensions and details shown on drawings, or between the drawings and these specifications, the more expensive construction shall be estimated before construction is started, the matter shall be submitted to the ENGINEER for clarification. Without such a decision, discrepancies shall be adjusted by the CONTRACTOR at his own risk and in settlement of any complications arising from such adjustment, the CONTRACTOR shall bear all of the extra expense involved.

11. MAINTENANCE DURING CONSTRUCTION: The CONTRACTOR shall maintain the Work from the beginning of construction operations until final acceptance. This maintenance shall constitute continuous and effective work prosecuted day by day with adequate equipment and forces to the end that the site and structures thereon are kept in satisfactory condition at all times, including satisfactory signing or marking as appropriate and control of traffic where required by use of traffic control devices as required by the State in which this project is located.

Upon completion of the Work, the CONTRACTOR shall remove all construction signs and barriers before final acceptance.

While undergoing improvements, the roads shall be kept open to all traffic by the CONTRACTOR. The CONTRACTOR shall keep the portion of the site being used by public traffic, whether it be through or local traffic, in such condition that traffic will be adequately accommodated. The CONTRACTOR shall bear all cost of signs and markings as required and other maintenance work during construction and before the Work is accepted and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary without direct compensation. The Contractor shall provide all

drainage protection at adjacent cell edges. This is to be installed and maintained at the Contractor's expense.

12. ACCESS FOR INSPECTION: Access for inspection shall be provided for representatives of the State of North Carolina.

13. Retainage of Contractor's Payment: The retainage shall be an amount equal to 10% of Contractor's partial pay estimate until 50% of the work has been completed. At 50% completion, further partial payments shall be made in full to the CONTRACTOR and no additional amounts may be retained unless the ENGINEER certifies that the job is not proceeding satisfactory, but amounts previously retained shall not be paid to the CONTRACTOR. At 50% completion or any time thereafter when the progress of the WORK is not satisfactorily, additional amounts may be retained but in no event shall the total retainage be more than 20% of the value of the work completed. Upon substantial completion of the work, the amount retained may be paid to the CONTRACTOR. When the WORK has been substantially completed except for WORK which cannot be completed because of weather conditions, lack of materials, or other reasons which in the judgment of the OWNER are valid reasons for non-completion, the OWNER may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the WORK still to be completed.

    Partial pay estimates may include stored materials. Contractor must submit invoices and all materials must be located at the site of the work. Retainage will not be held on stored materials.

14. Use of Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in conformance with instructions.

15. Cleaning Up: The contractor shall remove from the Owner's property and from all public and private property, at his own expense, all temporary structures, signs, rubbish, and waste. Also, any sediment deposited in the sediment pond by these activities shall be removed by the Contractor at his expense.

16. Guarantee: Notwithstanding anything to the contrary in this contract, the contractor shall guarantee the work, including the equipment installed under this contract, to be free of defects or faulty workmanship or materials for a period of one (1) year from the date of final acceptance. The Contractor shall be required to repair at his own expense all such defects which may develop during the specified time.

17. Confirmation Surveys: The Owner will provide the services of a Registered Land Surveyor in accordance with Section 01050 - Confirmation Surveys to perform confirmation surveys. The Owner will order the Surveyor to the site when notified by the Contractor. The Surveyor will perform one complete confirmation survey on each trip and shall not be held on-site by

the Contractor for corrective measures. Surveys required beyond what is specified due to defective or incomplete work shall be backcharged to the Contractor.

18. LINER TIE-IN: The Contractor shall be responsible for exposure of the liner at Cell No. 11 for tie-in by the liner subcontractor. Additionally, the contractor will be responsible for all stormwater / erosion control at the tie-in. Payment for this work shall be included in the cost for clay liner construction.

19. MOBILIZATION: Mobilization will be paid as follows; Pay Estimate No. 1 - 50%, Pay Estimate No. 2 - 25%, and Pay Estimate No. 3 - 25%.

20. CONSTRUCTION WATER: Construction water will be provided to the Contractor at no cost at the well site near the facility entrance. Water may also be obtained by the contractor from on-site ponds at his expense with his own equipment.

21. GEOMEMBRANE INSTALLATION: The time allowed for construction of this project shall include 20 days for the liner installer (by others) to install the FML and the geotextile fabric. The Contractor shall maintain the surface of the clay liner during the installation of the FML.

22. LEACHATE PIPE ON SLOPES: No gravel will be used on slopes. Solid HDPE pipe on slopes to cleanouts shall be wrapped in 6 oz/s.y. fabric.

23. MAINTENANCE OF STOCKPILES: The Contractor shall be responsible for maintaining construction stockpiles of sand and stone from the time he mobilizes to the site. The Contractor shall have appropriate equipment available to push-up the stockpiles as materials are received.

24. WORKING HOURS: The Contractor may work 7 days per week and may work outside of normal landfill operating hours. However, the Contractor shall be responsible for total site security when working outside of normal landfill operating days and hours.

25. ENGINEER / DESIGN ENGINEER: The "DESIGN ENGINEER" identified in the technical specifications and CQA Manual is the "ENGINEER" identified in the contract documents.

END OF SECTION

EXHIBIT "F"

ADDENDA

EXHIBIT "G"

CONTRACTOR'S SAFETY STATEMENT

REPUBLIC SERVICES, INC.

CONTRACTORS SAFETY STATEMENT - EXHIBIT G

As the authorized agent and representative of _____,
(company name)
hereafter known as "Contractor", I hereby certify that:

1) Contractor has received a written copy of the site-specific safety rules and will ensure that its employees and agents comply with those rules.

2) Contractor employees have received training in required safety topics in accordance with all applicable state and federal regulations.

3) Contractor has received a safety orientation including, but not limited to, accident / injury reporting, potential hazards in the workplace and emergency procedures.

4) Contractor will provide instruction to all of its employees and agents on the topics presented at the above-mentioned orientation, prior to their performing any activity on Republic Services property.

5) Contractor will provide required personal protective equipment for its employees working at Republic Services facilities.

6) Contractor will provide regular scheduled maintenance and safety inspections of any Contractor owned or leased equipment brought onto Republic Services facilities. Any equipment found to be defective will be taken out of service until repairs are made.

7) Contractor will provide to Republic Services the Material Safety Data Sheets (MSDS) sheets for any chemical products brought onto Republic Services property, and information as to the amount of such product and the expected duration of the time the product will be on the property.

This statement to be incorporated into, and become an integral part of the contract between the contractor and Republic Services.

_____
Authorized agent name (print)

_____ _____
Authorized agent name (sign) Date

EXHIBIT "H"

CERTIFICATES OF INSURANCE

SECTION 01000

PRE-CONSTRUCTION CONFERENCE

1.01 PRE-CONSTRUCTION CONFERENCE

Prior to beginning excavation activities, a pre-construction conference will be held on-site with representatives of:

Operator
Design Engineer
CQA Engineer
State Regulatory Agency

The purpose of the meeting will be to discuss issues relating to the proper prosecution of the work effort. The contractor shall have a schedule of work effort on either a CPM or Gannt format which defines all major work events, target dates, time of completion, and the interrelationship of work effort.

Special attention shall be given to who can make field changes, approve change orders, stop the work, or otherwise make changes in either the project design or the construction sequence. Attention shall also be given to the relationship with the State Regulatory Agency.

An agenda should be prepared for the meeting which specifically lists each item in the Rules for discussion.

The pre-construction conference will be the first of several project conferences or meetings. A schedule for meetings after the pre-construction conference will be established at the pre-construction conference.

Detailed Minutes of this meeting shall be kept and copies distributed to all parties in attendance.

-- END OF SECTION –

SECTION 01050

CONFIRMATION SURVEYS
(NOT IN THIS CONTRACT)

PART 1 - GENERAL

1.01 GENERAL

This section covers the confirmation surveys required for the project. Landfill confirmation surveys are required for the cell subgrade, the liner system components, all leachate system and underground pipelines and electrical, structures, roads and other improvements. This will require four (4) separate topographic surveys of the cell area and an overall construction site survey.

1.02 QUALITY ASSURANCE

The confirmation surveys shall be sealed by a registered land surveyor licensed in this State.

1.03 SHOP DRAWINGS

A. Grade Stakes Numbering System: Provide grid numbering methodology for review. Provide method to number and log individual stakes to assure no stakes remain in compacted soil liner.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.01 GRID OVERLAY

The Surveyor shall establish a grid pattern for control over the entire landfill cell area. The grid dimensions for the landfill cell shall be 50 foot by 50 foot. The grid pattern shall remain in the same location for each land survey described below. The Surveyor shall develop and utilize a numbering system for grid points. The Surveyor shall coordinate the establishment of the grid pattern with the grading Contractor and this grid pattern will be used in the construction staking.

3.02 CELL SUBGRADE SURVEY

The Surveyor shall provide a two (2) foot contour map with grid elevations shown for the landfill cell(s) subgrade. The survey shall represent as-built elevations immediately prior

to placement of the compacted clay liner. The survey shall confirm the correct slopes and grades with those given on the drawings.

3.03 COMPACTED CLAY LINER SURVEY

The Surveyor shall provide a two (2) foot contour map with grid elevations shown for the landfill compacted clay liner and subgrade. The grid elevations shall be presented to facilitate confirmation of the required thickness (see Figure 1). The survey shall represent as-built elevations immediately prior to placement of the geomembrane liner. The survey shall confirm the correct layer thickness, slopes, and grades with those given on the drawings. The survey shall include limits of the compacted clay liner.

3.04 GEOSYNTHETICS SURVEY OF LINER

The Surveyor shall provide a map locating the anchor trench, edge-of-liner, FML panels, all destructive test sample locations, and all FML repairs, and limits of each layer of geosynthetics and locations of all unique structures. The survey shall represent as-built final elevations. The surface area(s) of the geosynthetics shall be shown on the survey.

3.05 PROTECTIVE COVER ON LINER

The Surveyor shall provide a two (2) foot contour map with grid elevations shown for the landfill protective cover layer, compacted soil liner, and subgrade. The grid elevations shall be presented to facilitate confirmation of the required thickness (see Figure 1). The survey shall represent as-built final elevations. The survey shall confirm the correct layer thickness, slopes, and grades with those given on the drawings. The protective cover survey should include the location of rain flaps and all leachate system piping.

3.06 OVERALL CONSTRUCTION SITE SURVEY

The Surveyor shall provide a two (2) foot contour map of the entire construction site outside of the cells. This survey can be shown on one of the cell confirmation surveys or as a separate survey. This survey shall locate all improvements in this project including structures, underground pipelines and electrical, and roads.

3.07 GRADE STAKES

The Surveyor shall remove all grade stakes prior to placement of subsequent layer. The Surveyor shall develop and utilize a grade stake numbering system to log and number individual stakes.

3.08 SURVEYS

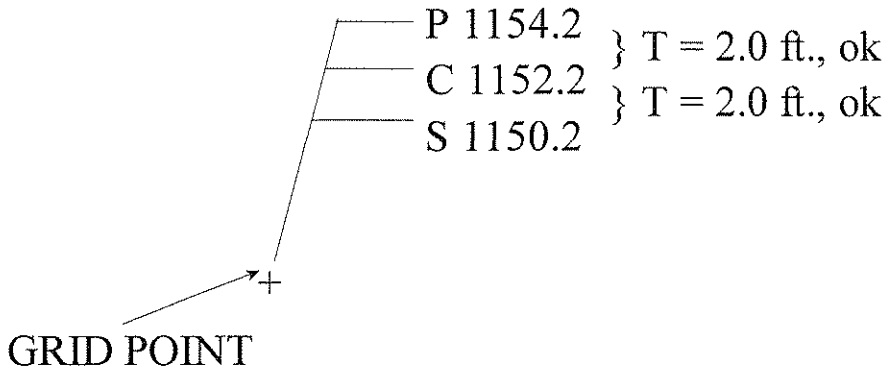
The Surveyor shall provide seven (7) sealed and signed prints of each survey and an electronic data file compatible with AutoCad Release 14. The surveys shall include the

data of surveys, vertical control utilized, and horizontal control utilized. The surveys shall be at a scale not less than 1" - 50'.

3.09 SCHEDULE

The Surveyor shall provide the confirmation surveys within five (5) days of completion of the particular portion of the work to which they pertain.

DATA PRESENTATION EXAMLE



KEY

P	**PROTECTIVE SOIL LAYER ELEVATION**
C	**COMPACTED CLAY LINER ELEVATION**
S	**COMPACTED SUBGRADE**
T	**THICKNESS**

FIGURE 1

--END OF SECTION--

SECTION 01051

CONSTRUCTION SURVEYS

PART 1 - GENERAL

1.01 GENERAL

This section covers construction staking and quantity surveys provided by the Contractor. Construction staking is required for horizontal and vertical location of all site improvements including grading, compacted soil liner, and protective cover. Quantity surveys are required for the purpose of determining quantities of excavation.

1.02 QUALITY ASSURANCE

Quantity surveys shall be performed under the direction of a registered land surveyor licensed in this State. Reports of quantity surveys shall be signed and sealed by a registered land surveyor licensed in this State.

1.03 SHOP DRAWING

A. Grade Stakes Numbering System

Provide grid numbering methodology (in cells) for review. This shall be coordinated with the confirmation surveying. Provide method to number and log individual stakes to assure no stakes remain within the cell(s).

1.04 PAYMENT

All payment for construction surveying shall be included in the lump sum price bid in the Proposal for Construction Surveying.

PART 2 - PRODUCTS

2.01 GENERAL

The CONTRACTOR shall furnish all such stakes, spikes, steel pins, templates, platforms, equipment, instruments, tools, and other materials as may be required for staking and quantity surveys.

PART 3 - EXECUTION

3.01 CONSTRUCTION STAKING

A. General

1. The DESIGN ENGINEER will provide benchmarks for vertical and dimensional data for horizontal location.

2. From a baseline and benchmarks, the CONTRACTOR shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work prescribed in the specifications or on the Drawings, subject to such modifications as may be required to meet changed conditions or as a result of necessary modifications to the work.

3. It shall be the responsibility of the CONTRACTOR to maintain and preserve all benchmarks shown on the plans and any other benchmarks provided by the DESIGN ENGINEER.

4. All survey data shall be recorded in accordance with standard and approved methods. All field notes, sketches, records, and computations made by the CONTRACTOR in laying out the work shall be available at all times during the progress of the work for the ready examination by the DESIGN ENGINEER or CQA ENGINEER or his duly authorized representative.

5. The DESIGN ENGINEER or CQA ENGINEER may make checks as the work progresses to verify lines and grades established by the CONTRACTOR and to determine the conformance of the completed work as it progresses with the requirements of the Contract Documents and Drawings. Such checking by the DESIGN ENGINEER or CQA ENGINEER or his representative shall not relieve the CONTRACTOR of his responsibility to perform all work in accordance with the Contract Documents and Drawings and the lines and grades given therein. In the event that location marks as established by the CONTRACTOR are found to be inaccurate or inadequate, work shall be suspended until corrections have been made.

B. LANDFILL CELL(S)

The CONTRACTOR shall establish a grid pattern for control over the entire landfill cell area. The grid dimensions shall be 50 foot by 50 foot. The grid pattern shall remain in the same location for subgrade, compacted soil liner, and protective cover construction. The CONTRACTOR shall develop and utilize a numbering system for grid points. The CONTRACTOR shall coordinate the establishment of the grid pattern with the confirmation surveyor so that the same grid pattern may be used for

the confirmation surveys. The grid pattern shall be submitted to the DESIGN ENGINEER for approval prior to any grading activities in the cell area.

3.02 QUANTITY SURVEYS

The CONTRACTOR's surveyor shall develop topographic surveys for the purpose of determining quantities of excavation. Quantities of excavation and fill shall be calculated by the average end area method or utilizing digital terrain modeling software. The CONTRACTOR's surveyor shall develop topographic surveys after completion of clearing, grubbing and stripping topsoil and again after completion of grading. Additional cross surveys may be required depending on sequencing of construction. The OWNER may survey portions of the work for confirmation of quantities.

3.03 GRADE STAKES

The CONTRACTOR shall remove all grade stakes prior to placement of subsequent layers during cell construction. The CONTRACTOR shall develop and utilize a grade stake numbering system to log and number individual stakes.

--END OF SECTION--

SECTION 01300

SUBMITTALS

1.01 DESCRIPTION

A. CONTRACTOR shall prepare and furnish the following submittals for this project:.

1. Construction Progress Schedules
2. Shop Drawings and Product Data
   a. Construction Surveys
      1. grade stakes numbering system
      2. initial topographic survey
   b. Silt fence and Inlet Protection
      1. filter fabric
      2. hog wire
      3. posts
   c. Temporary Grassing
      1. seed
      2. mulch
   d. Access Road
      1. graded aggregate
      2. road stabilization fabric
   e. Leachate Pipe
      1. solid and perforated HDPE pipe
   f. HDPE Fabrication
      1. all fabricated structures
   g. Geotextile
      1. geotextile fabric
   h. Permanent Grassing
      1. soil analysis and recommendation
      2. grass seed
      3. fertilizer
      4. lime
      5. mulch
   i. Protective Cover
      1. sandy soils
      2. washed sand
   j. Leachate Sump Pump
      1. pump system
      2. sump components
3. Application for Payment

B. Type or neatly letter the following identifying title on all submittals:

1.02 CONSTRUCTION PROGRESS SCHEDULES

A. Submit construction progress schedules for the work to DESIGN ENGINEER, with subschedules of related activities which are essential to progress of the Work.

B. Prepare schedules in the form of a horizontal bar chart.

1. Provide separate horizontal bar for each sequence of construction by activity clearly referenced to the corresponding specification section number.

2. Show the chronological order, duration, and projected percentage completion of each sequence of construction.

3. Horizontal time scale: Maximum unit - one (1) month.

4. Sheet size shall be 8½" x 11".

5. Show timeframe for submittal of shop drawings, product data, samples, operation and maintenance data, and other pertinent submittals.

6. Show dates of applications for progress payments at the bottom of the bar chart, indicate payment number, amount of payment request, and cumulative payment to date.

C. Submission Requirements

1. CONTRACTOR shall submit schedules as provided in Article 2.05 of the General Conditions.

2. Submit revised Progress Schedule with each application for payment.

1.03 SHOP DRAWINGS

A. General

1. CONTRACTOR shall submit shop drawings, product data and samples required by the Contract Documents.

2. Designate in the construction progress schedule the dates for submission and the dates that reviewed shop drawings, product data and samples will be needed to cause no delay in the construction progress.

B. Shop drawings

1. Drawings shall be presented in a clear and thorough manner.

   a. Details shall be identified by reference to sheet and detail number shown on Contract Drawings and applicable specification section(s).

   b. Minimum sheet size: 8 ½" x 11"; maximum sheet size 24" x 36".

2. Product data

   a. Clearly mark each copy to identify pertinent products or models.
   b. Show performance characteristics and capacities.
   c. Show dimensions and clearance capacities.
   d. Show wiring or piping diagrams and controls.

3. Manufacturer's standard schematic drawings and diagrams

   a. Modify drawings and diagrams to delete information which is not applicable to the work.

   b. Supplement standard information to provide information specifically applicable to the work.

4. Samples

   a. Office samples shall be of sufficient size and quantity to clearly illustrate:

      1. Functional characteristics of the product, with integrally related parts and attachment devices.

      2. Full range of color, texture, and pattern.

C. CONTRACTOR Responsibilities

1. Review shop drawings, product data, and samples prior to submission.

2. Determine and verify:

   a. Field measurements,
   b. Field construction criteria,
   c. Catalog numbers and similar data, and
   d. Conformance with specifications.

3. Coordinate each submittal with requirements of the Work and of the Contract Drawings.

4. Notify the DESIGN ENGINEER in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.

5. Begin no fabrication or work which requires submittals until return of submittals with DESIGN ENGINEER review stamp.

D. Submission requirements

1. Make submittals for all items prior to ordering or fabrication, and in such sequence as to cause no delay in the Work or in the work of any other CONTRACTOR.

2. Number of submittals required

a. Shop Drawings

Submit a minimum of five (5) copies as required by General Conditions, plus additional copies which CONTRACTOR requires.

b. Samples

Submit the number stated in each Specification Section.

3. Submittals shall contain:

a. The date of submission, submission number (in consecutive order), and dates of any previous submissions.

b. Contract identification as specified in Article 1.01, paragraph B.

c. The name of:

1. CONTRACTOR
2. Supplier
3. Manufacturer

d. Identification of the product with the specification section number.

e. Field dimensions clearly identified as such.

f. Relation to adjacent or critical features of the work or materials.

g. Applicable standards, such as ASTM or Federal specification numbers.

h. Identification of deviations from Contract Documents.

i. Identification of revisions on resubmittals.

j. CONTRACTOR's review stamp.

4. All shop drawings shall be coordinated between trades prior to submission for review and approval.

a. Manufacturer's equipment submittals with statements such as "Field Wiring by Others", "Control Wiring by Others", or "Not by Manufacturer" (referring to related fittings, control or interlock wiring, etc.) will be "REJECTED" unless specifically noted as having been coordinated with all related trades.

5. CONTRACTOR's stamp initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

E. Resubmission requirements

1. CONTRACTOR shall make any corrections or changes in the submittals required by the DESIGN ENGINEER and resubmit.

2. Drawings and Product Data

a. Revise initial drawings or data, and resubmit as specified for the initial submittal.

b. Indicate any changes which have been made other than those requested by the DESIGN ENGINEER.

3. Samples

Submit new samples as required for initial submittal.

F. Distribution

CONTRACTOR shall distribute reproductions of Shop Drawings which carry the DESIGN ENGINEER's review stamp to:

a. Job site file,
b. Record documents file, and
c. Others as required.

G. DESIGN ENGINEER will return three (3) reviewed and appropriately stamped copies of submittals to CONTRACTOR for distribution, or for resubmission, unless CONTRACTOR requests and submits additional copies as provided in paragraph D of this Article 1.04.

1.04 APPLICATION FOR PAYMENT FORMAT

A. The CONTRACTOR shall submit a sample Application for Payment for approval by the DESIGN ENGINEER prior to submittal of the first progress payment. This document should be similar to the Engineers Joint Documents Committee EJCDC No. 1910-8-E, attached.

B. Progress payments on account of unit price work will be based on the number of units completed. An application for payment worksheet, similar to the attached document, shall accompany the application for payment. The CONTRACTOR shall submit a sample worksheet for approval by the DESIGN ENGINEER prior to submittal of the first progress payment.

APPLICATION FOR PAYMENT NO. _____

To:_____ (Owner)
From:_____ (Contractor)
Contract:_____
Project:_____
OWNER's Contract No. _____ ENGINEER'S Project No._____
For Work accomplished through the date of:_____

1.	Original Contract Price:		$ _____
2.	Net change by Change Orders and Written Amendments (+ or -):		$ _____
3.	Current Contract Price (1 plus 2):		$ _____
4.	Total completed and stored to date:		$ _____
5.	Retainage (per Agreement)		$ _____
	____% of completed Work::	$ _____	
	____% of stored material:	$ _____	
	Total Retainage:		$ _____
6.	Total completed and stored to date less retainage (4 minus 5)		$ _____
7.	Less Previous Application for Payments:		$ _____
8.	**DUE THIS APPLICATION (6 MINUS 7)**		$ _____

Accompanying Documentation:

CONTRACTOR's Certification:

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by prior Applications for Payment numbered 1 through ____ inclusive; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective.

Dated _____ _____
CONTRACTOR

By: _____

State of _____
County of _____
Subscribed and sworn to before me this _____
day of _____, _____

Notary Public
My Commission expires:_____

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Dated _____ _____
ENGINEER

By: _____

APPLICATION FOR PAYMENT WORKSHEET

TO: (Owner's Name and Address) _____

FROM: (Contractor's Name and Address) _____

PROJECT: _____

PAY REQUEST #: _____

PERIOD TO: _____

		CONTRACT			WORK COMPLETED THIS PERIOD		WORK COMPLETED TO DATE		STORED MATERIALS		
Item No.	Description of Work	Qty.	Unit Price	Total Amount	Qty.	Total Amount	Qty.	Total Amount	Qty.	Unit Price	Amount Presently Stored
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
	TOTALS										
CHANGE ORDER NO. 1 (etc.)											
1											
2											
3											
	TOTALS										

SECTION 01400

QUALITY CONTROL

1.01 DESCRIPTION

A. The OWNER shall employ and pay for the services of a third party CQA firm and a geotechnical engineering firm to confirm the installation of the geomembrane and clay liners, and perform soils, concrete and other required testing. The CONTRACTOR shall coordinate his work with the third party firms. The third party CQA firm shall use the CQA manual for this project which is included as a part of these specifications by reference.

1. Employment of the third party CQA firm and geotechnical firm shall in no way relieve CONTRACTOR's obligations to perform the Work of the Contract.

2. While the OWNER will provide all materials testing, any retesting required due to failure of material installation by CONTRACTOR shall be back-charged to the CONTRACTOR.

B. Related requirements specified in other sections:

1. Certification of Products: The respective sections of Specifications.

2. Test, adjust and balance of equipment: The respective section of Specifications.

3. Laboratory tests required, and standards for testing: The respective section of the Specifications.

C. Testing laboratory inspection, sampling and testing is required for but not limited to the following:

1. Section 02210 - Grading
2. Section 02220 - Trenching, Backfilling and Compaction
3. Section 02250 - Compacted Clay Liner
4. Section 02253 – Protective Cover – On Liner – Native Sandy Soils
5. Section 02255 - Protective Cover – On Liner – Washed Sand
6. Section 02745 - Leachate Piping
7. Section 02747 - Leachate Collection System
8. Section 02750 - HDPE Geomembrane Liner

1.02 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualifications", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction, as appropriate.

C. Authorized to operate in the State in which Project is located.

D. Must have established credentials and experience in CQA of geomembrane and compacted clay liners, as appropriate.

E. Testing Equipment

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:

a. National Bureau of Standards
b. Accepted values of natural physical constants.

1.03 LABORATORY DUTIES

A. Cooperate with DESIGN ENGINEER, CQA ENGINEER and CONTRACTOR: provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specified standards.

2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify DESIGN ENGINEER and CONTRACTOR of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test and inspection; two copies each to DESIGN ENGINEER, and one copy to CONTRACTOR and record documents file. Each report shall include:

1. Date issued.

2. Project title and number.

3. Testing laboratory name, address and telephone number.

4. Name and signature of laboratory inspector.

5. Date and time of sampling or inspection.

6. Record of temperature and weather conditions.

7. Date of test.

8. Identification of product and specification section.

9. Location of sample or test in the Project.

10. Type of inspection or test.

11. Results of tests and compliance with Contract Documents.

12. Interpretation of test results, when requested by DESIGN ENGINEER.

E. Perform additional tests as required by DESIGN ENGINEER or the OWNER if initial tests are not conclusive to merit acceptance.

1.04 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.

2. Approve or accept any portion of the work.

3. Perform any duties of the CONTRACTOR.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to work, to manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.

D. Furnish copies of product test reports as required.

E. Furnish incidental labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

--END OF SECTION--

SECTION 01560

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Installation of soil erosion control devices.

B. Maintenance of soil erosion devices during construction.

C. Removal of temporary soil erosion control devices after stabilization of disturbed areas.

D. Temporary grassing for soil erosion control.

1.02 QUALITY CONTROL

A. After installing the soil erosion control devices as called for on the Construction Plans, the CONTRACTOR shall assure himself that all reasonable measures possible have been taken to prevent the siltation of nearby water courses.

B. The erosion and sediment control shall conform with the rules and regulations of the Erosion Control Ordinance of the North Carolina Department of Natural Resources and Community Development.

1.03 MEASUREMENT AND PAYMENT

A. Silt Fence

1. Measurement shall be from end-to-end along its base for each separate installation.

2. Payment shall be at the price per linear foot on the Bid Form.

B. Temporary Grassing

1. Measurement shall be made horizontally.

2. Payment shall be at the unit price per acre on the Bid Form for the acres actually seeded.

C. Inlet Protection

1. Measurement shall be of the actual quantity installed.

2. Payment shall be at the unit price on the Bid Form for Inlet Protection.

D. Excelsior Lined Stormwater Conveyance Channel (SCC)

1. Measurement shall be along the centerline of the SCC in linear feet.

2. Payment shall be at the unit price on the Bid Form for SCC.

PART 2 PRODUCTS

2.01 SILT FENCE AND INLET PROTECTION

A. Posts

Silt fence posts shall be 2" x 4" pressure treated pine, a minimum of four (4') feet long and spaced a maximum of six (6') feet apart.

B. Woven Wire Fence

Wire fence reinforcement shall be a minimum of 14-gauge 4" x 4" hogwire.

C. Filter Fabric

Use a synthetic filter fabric or a previous sheet of polypropylene, nylon, polyester, or polyethylene yarn, which is certified by the manufacturer or supplies as conforming to the requirements shown in the Table below.

Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six (6) months of expected usable construction life at a temperature of 0 to 120°F.

Physical Property	Requirements
Filtering Efficiency	85% (min)
Tensile Strength at 20% (max) Elongation	Standard Strength-30 lb/lin in (min) Extra Strength-50 lb/lin in (min)
Slurry Flow Rate	0.3 gal/sq ft/min (min)

2.02 RIP-RAP FOR STORMWATER CONVEYANCE CHANNELS AND OUTLET PROTECTION

A. Stone

Stone for rip-rap shall be durable, dense, specifically selected and graded, quarried stone. The d_{50} size shall be 6, 9, or 12 inches as called for on the plans.

B. Gravel

Gravel for filter blanket shall be ASTM No. 57.

C. Filter Fabric

Filter fabric for filter blanket shall be a non-woven geotextile suitable for filtration and separation. The fabric weight shall be a minimum of 6.0 ounces per square yard.

2.03 TEMPORARY GRASSING

A. Temporary seed

Temporary seed shall be annual ryegrass and pearl millet at the planting rates specified herein.

B. Mulch

Mulch for temporary grassing shall consist of grain straw or other acceptable material, and shall have been approved by the DESIGN ENGINEER before being used. All mulch shall be reasonably free from mature seedbearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sandbur, Wild Garlic, Wild Onion, Bermuda Grass, Crotalaria, and Witchweed, and free from an excessive amount of noxious weeds at the time of use of the mulch, and also there shall be compliance with all applicable State and Federal domestic plant quarantines. Straw mulch that is matted or lumpy shall be loosened and separated before being used.

Material for holding mulch in place shall be an approved binding material. No asphalt tacking material will be allowed.

2.04 TEMPORARY STORMWATER CONVEYANCE CHANNEL LINER

A. Excelsior Matting

Excelsior matting shall be an erosion control blanket consisting of an excelsior mat with a synthetic netting on one side similar and equal to Curlex as manufactured by American Excelsior Company.

PART 3 EXECUTION

3.01 GENERAL

Construct temporary and permanent erosion control measures as shown on the plans, as required by site conditions, regulatory agency or DESIGN ENGINEER. All permanent erosion control work shall be incorporated into the project at the earliest practicable time. Temporary erosion control measures shall be coordinated with permanent erosion control measures and all other work on the project to assure economical, effective, and continuous erosion control throughout the construction and post construction period and to minimize siltation of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces, or other property. If active construction ceases for more than 30 days, all disturbed areas shall be seeded and mulched using the temporary seed type and planting rates specified herein.

The CONTRACTOR shall be liable for all damages to public or private property and fines as may be placed on the project by the local regulatory agencies due to soil erosion from the project site. Clear only those areas required to install the soil erosion control devices, request an inspection by the local agency having jurisdiction.

All erosion control devices shall be inspected by the CONTRACTOR after each rainfall. Any required repairs shall be made immediately. Sediment deposits shall be removed when deposits reach approximately one-half of the capacity of the erosion control.

3.02 SILT FENCE

A. Silt fence shall be installed in accordance with the details in the plans.

B. Should the filter fabric deteriorate or become ineffective prior to the end of the construction as determined by the DESIGN ENGINEER or CQA ENGINEER, the fabric shall be replaced immediately at no additional cost to the OWNER.

3.03 RIP-RAP

A. Prepare subgrade to the required lines and grades as shown or indicated on the contract drawings. Place any fill required in the subgrade to a density equal to that of the surrounding area. Place filter fabric on the finished subgrade.

B. Place rip-rap by mechanical methods, augmented by hand placing where necessary to prevent damage to permanent works, provided that when the rip-rap is completed it forms a properly graded, dense, neat layer of stone. The completed rip-rap shall have a thickness as shown on the plans.

3.04 TEMPORARY GRASSING

Temporary grassing procedures will be implemented only under the direction of the DESIGN ENGINEER, a cease of construction in excess of 30 days, or as required by the soil erosion inspector.

Seeding for temporary grassing shall be applied to all shoulders, side stormwater conveyance channels, cut slopes, fill slopes, and any other area disturbed by the CONTRACTOR and not designated for pavement or structures. Temporary seeding shall occur immediately following final land disturbing activities. Any unseeded area which erodes shall be repaired to the satisfaction of the DESIGN ENGINEER at no additional cost to the OWNER. Temporary seeding shall be applied at the following rates:

Temporary Seeding	LBS / Acre	Depth of Cover	Date of Planting
German Millet	40	¼" - ½"	5/1 - 8/15
Rye (Grain)	120	¼" - ½"	1/1 - 5/1

Areas not receiving permanent cover that will be exposed for more than three (3) months shall receive temporary grassing. Temporary grassing shall consist of rye grass. Other cereal grass (i.e., millet) may also be used. Other grassing methods which have proved effective by the operator may be substituted for these.

3.05 INLET PROTECTION

A sump shall be constructed around the drop inlet and silt fence installed in accordance with the details in the plans for Drop Inlet Protection.

3.06 TEMPORARY STORMWATER CONVEYANCE CHANNEL LINER

A. After installation of the utilities, the stormwater conveyance channels shall be reconstructed as near as possible to the original configuration.

B. Apply lime, fertilizer, and seed to the stormwater conveyance channel and adjoining areas in accordance with the grassing specifications.

C. Place the excelsior mat in accordance with the detail and table in the erosion control plan.

D. Start laying the mat from the top of the upstream end of the channel and unroll it downgrade. Do not stretch netting.

E. Bury the upslope end and staple the mat every 12" across the top end, every three (3) feet around the edges and across the mat so that it is held closely against the soil. However, do not stretch the mat when stapling.

F. To join ends of strips, insert the new roll of mat in a trench as with upslope end and overlap it 18" with the previously laid upper roll. Turn under 6" of the 18" overlap and staple every 12" across the end.

3.07 REMOVAL OF TEMPORARY EROSION DEVICES

The CONTRACTOR shall remove all sedimentation and erosion control devices upon the approval of permanent seeding and stabilization by the agency having jurisdiction of the area and the DESIGN ENGINEER. All sediment deposits remaining in place after the erosion control devices are removed shall be dressed to conform with the existing grade, prepared, and seeded. The cost of removal and cleanup shall be included in the cost of the installation of the device or in the cost for maintenance.

3.08 CLEAN OUT PERMANENT EROSION CONTROL DEVICES

The CONTRACTOR shall clean out permanent sediment and erosion control devices upon approval of permanent seeding and stabilization by the agency having jurisdiction of the area and the DESIGN ENGINEER. The devices shall be cleaned out to the original condition. The cost of cleanup shall be included in the cost of installation or in the cost of maintenance of the device.

--END OF SECTION--

SECTION 01666

TESTING PIPING SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section covers the requirements for CONTRACTOR's testing gravity and pressure piping systems not specified under other Sections.

B. Tests shall be performed on but not limited to the following:

1. Pressure Leachate Collection Pipes
2. Force Mains
3. Leachate Collection Pipes
4. Gravity Manholes

C. All tests require the presence of the CQA ENGINEER or his representative.

D. If the installation fails to meet test requirements, the CONTRACTOR shall, at his expense, determine the source of leakage and make repairs as necessary to eliminate leakage and retest as directed.

E. All costs for the testing shall be borne by the CONTRACTOR.

F. Advise the CQA ENGINEER at least 48 hours before tests are to be conducted.

1.02 MEASUREMENT AND PAYMENT

No measurement will be made. Payment for work done under this section shall be included in the pay item for the work which required testing of piping systems.

PART 2 PRODUCTS

2.01 GENERAL

A. All equipment shall be the best of their particular class and suited for the intended use.

PART 3 EXECUTION

3.01 GENERAL

A. If the specified rate of leakage is exceeded, on test, the CONTRACTOR shall locate the points of excessive leakage and institute appropriate measure of correction, whereupon the length of pipeline shall be retested and this procedure continued until test requirements are met.

B. Unless specified otherwise the following tests shall be performed as directed by CQA ENGINEER.

1. Exfiltration Testing

   a. All gravity leachate piping constructed under this Contract.
   b. All HDPE manholes and other fabricated structures.

2. Hydrostatic Testing

   a. Pressure Leachate Pipes
   b. Force Mains

3.02 EXFILTRATION TESTING

A. The CQA ENGINEER shall require exfiltration tests on all HDPE manholes and on gravity piping.

B. The section to be tested and the manner of test will be determined by the CQA ENGINEER.

C. Procedure for Exfiltration Testing:

1. Plug each end of section or all openings to manhole to be tested with watertight bulkheads.

2. Insert in each bulkhead at the top of the pipeline a two (2") inch pipe with 90° elbow, that will extend four (4') feet vertically above the top of the pipeline or above the groundwater line, whichever is higher. Manholes shall be tested at full depth with the water level at the cover ring.

3. The elevations of the top of the two (2") inch pipe at each bulkhead shall be the same.

4. Fill the pipeline with clear water until the water level is at the top of the two (2") inch pipe at the upper end of section or at the manhole ring.

5. Maintain the water level by adding accurately measured amounts of water for a period of thirty minutes, not allowing the lower pipe to overflow.

D. The maximum length of a section of pipeline to be tested by means of an exfiltration test at one time shall be limited to 1,000 linear feet.

E. The maximum permissible leakage determined by exfiltration shall be the rate of 25 gallons per inch interval diameter of pipe per mile of pipe line per 24 hours, inclusive of all appurtenances within the section such as manholes, house connections, etc. The length of pipe used in the computation shall be the horizontal distance between manhole centerlines of the section being tested. The maximum permissible leakage for manholes shall be 0.01 gallons per vertical foot per day.

F. Once infiltration is found to be within allowable limits, remove all bulkheads.

3.03 HYDROSTATIC TESTING

A. The following piping system shall be Hydrostatically tested:

1. Leachate Force Mains;

2. All other pressure piping systems not specifically requiring testing under other Sections; and

3. Do not test piping systems with water where water testing will be harmful to the system operations, such as for air and gas piping systems.

B. After the pipe has been laid and backfilled between fittings, and before any fittings are covered, unless this requirement is waived by the CQA ENGINEER, all newly laid pipe, above ground or below ground, or any valved section thereof, shall be subjected to a hydrostatic gauge pressure as hereinafter tabulated.

1. All piping that will be considered inaccessible or impossible to repair after the completion of all work shall be hydrostatically tested while still accessible.

2. Examples of such piping are those near or under basins, paved roads, concrete structures and concrete foundations.

3. Note: All piping shall have reaction blocking (thrust blocks) in place before testing, as required.

C. Tests shall be under the direction of the CQA ENGINEER. The CONTRACTOR shall furnish a pressure gauge for measuring the pressure on the pipeline, shall provide a corporation cock to attach gauge or pump connection, and shall provide plugs to seal taps after use in testing, and shall also furnish a suitable pump, pipe, appliances, and other appurtenances necessary to make these tests.

D. Each section of pipe shall be filled slowly with water and the specified test pressure, measured at the point of lowest elevation, shall be applied to the pipe in a satisfactory manner. The CONTRACTOR will furnish all test water.

E. Before applying the specified water test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, as directed by the CQA ENGINEER, if necessary, at points of highest elevation, and afterward tightly plugged.

F. The test pressure shall be maintained for a sufficient length of time prior to the test to allow for thorough examination of joints and elimination of leakage where necessary. The pipe line shall be made watertight under the test pressure.

G. All exposed pipes, fittings, valves, hydrants, and joints will be carefully examined during the open trench test. Any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced by the CONTRACTOR with sound material and the test shall be repeated until satisfactory to the CQA ENGINEER.

H. Hydrostatic test pressures shall be as follows:

System	Pressure Test Rating (psi)
Miscellaneous pressure pipe	50
Pressure leachate piping (force main)	100
Secondary Containment Pipe	Actual Maximum Pressure plus 5 psi

1. The test shall be pressurized to the required test pressure.

2. The test shall be conducted for a minimum of six (6) hours.

I. The tested section will not be accepted if it has any observed leakage or test pressure drops more than one (1) psi during the leakage study.

--END OF SECTION--

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Extent of site clearing is shown on drawings.

B. Site clearing work includes, but is not limited to:

1. Protection of trees outside of clearing limits.
2. Removal of trees and other vegetation within site clearing limits.
3. Grubbing within the clearing limits.
4. Stripping topsoil.
5. Removal of debris on the site.

1.02 RELATED DOCUMENTS

A. Section 02930 - Grassing

B. Drawings and general provisions of Contract, including General and Supplementary Conditions, and Detailed Specification sections, apply to work of this section.

1.03 JOB CONDITIONS

A. Examine areas for conditions under which work is to be performed. Report to the DESIGN ENGINEER all conditions contrary to those shown on the contract drawings or specified herein and all other conditions that will affect satisfactory execution of the work. Do not proceed with work until unsatisfactory conditions have been corrected and authorization has been given by Owner's representative.

B. Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

C. Provide protection necessary to prevent damage to existing improvements indicated to remain in place on adjoining properties and on Owner's. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction, without additional cost to the owner.

D. Keep dirt, dust, noise, and other objectionable nuisances to a minimum. Use temporary enclosures, coverings, and sprinkling, or a combination thereof, as necessary to limit dust to lowest practicable level, except do not use water to the extent of causing flooding, contaminated runoff, or icing.

E. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, access foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Water trees and other vegetation to remain within limits of the contract work as required to maintain their health during course of construction operations.

2. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Owner, without additional cost to Owner. Employ licensed arborist to repair damages to trees and shrubs.

3. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.

F. Property corners, iron pipe and/or monuments, shall be located and protected before beginning clearing operations.

1.04 QUALITY ASSURANCE

A. Obtain copy of Land Disturbing Permit and maintain at the site.

B. Obtain the required permits and conform to applicable codes for disposal of debris off-site and burning of debris on-site.

C. Perform all work in accordance with requirements of OSHA and the Environmental Protection Agency in addition to State and local requirement.

1.05 MEASUREMENT AND PAYMENT

A. Clearing and Grubbing

Measurement for Clearing and Grubbing and for Stripping Topsoil will be by the acre. The cost of all required work and all costs incidental thereto shall be included in the unit prices in the Proposal for "Clearing and Grubbing".

B. Topsoil Stripping

Measurement for topsoil stripping shall be by the acre. The cost of all required work to remove and stockpile topsoil and all costs incidental thereto shall be included in the unit price in the Proposal for "Stripping and Stockpile Topsoil".

PART 2 PRODUCTS

2.01 TOPSOIL

A. Is defined as natural, friable soil, characteristic of representative soils that produce heavy growth of crop, grass, or other vegetation is generally that soil strata found to 24 inches depth.

B. Topsoil for placement on graded areas shall be free from roots, stones, and other materials that may hinder grading, planting, and maintenance operations, and shall be free from objectionable weed seeds and toxic substances.

PART 3 EXECUTION

3.01 CLEARING

A. Clearing shall consist of the cutting, removal, and satisfactory disposal of all trees and shrubs within the clearing limits as designated on the plans and/or within easements and right-of-ways which will require construction work during the project.

B. Clear only those areas required to install the soil erosion control devices as shown on the plans and outlined in Section 01560 - Erosion and Sediment Control for Utilities of these specifications prior to starting overall clearing operations.

C. Repair and maintain erosion control devices during construction in order to always assure their efficiency.

D. Trees to remain shall be trimmed of branches which will obstruct the new construction or as directed by the DESIGN ENGINEER or CQA ENGINEER. Branches to be trimmed shall be neatly cut close to the bole of the tree or main branch. Cuts more than 1 ½" in diameter shall be painted with a tree wound paint formulated for use on damaged plant tissues.

3.02 GRUBBING

A. Grubbing shall consist of the removal and disposal of stumps, roots larger than three (3) inches in diameter and matted roots from the designated clearing limits to a depth of 18 inches below the original surface level of the ground.

B. For trees to remain, provide protection for roots over 1 ½" in diameter which are cut during grubbing. Coat cut faces with a tree wound paint formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out, cover with earth as soon as possible.

C. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground, unless further excavation is indicated.

D. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.

3.03 TOPSOIL STRIPPING, STOCKPILING AND SPREADING

A. All topsoil within the clearing limits shall be stripped and stockpiled as directed by the Owner.

B. Topsoil shall be placed on all shoulders, slopes, stormwater conveyance channels, and other earth areas graded under this contract, unless otherwise specified on the plans. Topsoil shall be uniformly placed on these areas to a compacted depth of not less than 4 inches or more than 6 inches. Topsoil depth on landscape areas shall be no less than 6 inches. The material shall be placed, leveled, and lightly compacted with at least one pass of a cultipacker, or other approved equipment weighing 100 to 160 pounds per linear foot of roller, to required cross sections.

3.04 REMOVAL OF DEBRIS

A. Removal of debris shall consist of the satisfactory disposal of any garbage or rubble within the clearing limits, easements, right-of-way or as specifically designated on the plans.

3.05 DISPOSAL OF MATERIAL

A. All vegetation and debris within the areas to be cleared shall become the property of the Contractor upon the start of work and shall be removed from the site and properly disposed.

B. Burning of combustible materials removed by clearing and grubbing operations will be allowed providing the Contractor obtains such permits and approvals required by local authorities, if available. The Contractor will be responsible for controlling fires in compliance with all Federal, State, and Local laws and regulations. The securing of necessary burning permits shall be the responsibility of the Contractor. All

burning shall be under the constant care of competent watchmen. All materials resulting from clearing and grubbing operations and disposed of by burning on the site shall be thoroughly and completely reduced to ashes.

--END OF SECTION--

SECTION 02210

GRADING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Excavation, fill, and preparation of subgrade for landfill, roadways, embankments, building foundations, and detention basins.

B. All excavation shall conform with the lines and grades as shown on the plans or established by the DESIGN ENGINEER.

1.02 RELATED WORK

Drawings and general provisions of Contract, including General and Supplementary Conditions, and Detailed Specification sections, apply to work specified in this section.

1.03 QUALITY ASSURANCE

A. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Owner will engage soil testing and inspection service, for quality control testing during earthwork operations.

C. Test reports for the following items shall be given to the DESIGN ENGINEER and will be available for the Contractor directly responsible for earthwork being tested:

1. Field Density Test Reports

2. One (1) optimum moisture-density curve for each type of soil encountered.

3. Other field inspection reports as deemed appropriate.

1.04 APPLICABLE STANDARDS

The most recent publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

American Society for Testing and Materials (ASTM) Publications (Latest Version):

D 422	Method of Particle-Size Analysis of Soils
D 698	Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 5.5 lb. Rammer/12 inch drop
D 1556	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D 2922	Density of Soil in Place by the Nuclear Gage
D 2937	Density of Soil In Place by the Drive-Cylinder Method.
D 4318	Test Method For Liquid Limit, Plastic Limit and Plasticity Index of Soils

1.05 SUBMITTALS

Proposed technique for rock excavation (Blasting not allowed).

1.06 MEASUREMENT AND PAYMENT

A. General

Measurement shall be in accordance with Section 01051 - Construction Surveys.

B. Unclassified Excavation

1. Unclassified Excavation shall consist of all the excavated material to (1) compacted clay liner subgrade, (2) road subgrade or (3) other structure subgrade. Unclassified excavation shall also include the subsequent placement of all material above the subgrades whether into embankments, disposal, or stockpiling in designated areas of all material, regardless of it's nature of the manner in which it is removed from existing grade to the subgrades. For the landfill cell, unclassified excavation is defined as all materials to the depth indicated below the FML to accommodate the clay liner. For roadways the subgrade is defined as the subsurface prepared to receive sand clay base and aggregate. Suitable and designated unclassified excavation materials only shall be used for all embankments fills, roadways, sediment basin embankments and other structural uses on the job site wherever such used are indicated or required.

2. Payment for unclassified excavation shall be included in the unit price per cubic yard stated in the Proposal for "unclassified excavation".

C. Unsuitable Material

Areas requiring undercutting due to being unstable as determined by the Design Engineer shall be measured in the presence of the Design Engineer. Undercut excavation shall include the subsequent placement of all fill material required to replace undercut material. Payment shall be for the in-place cubic yard unit price stated in the proposal for "unsuitable material". No payment will be made for undercut excavation performed prior to approval by the Design Engineer. Additionally, no payment shall be made for over excavation of unsuitable materials and no payments shall be made for excavation of unsuitable material volumes filled prior to inspection by the Design Engineer.

D. On-Site Borrow

Borrow from on-site shall consist of material excavated from designated on-site borrow area(s) and placed and compacted for construction of embankment and subgrade. Payment shall be included in the unit price bid per cubic yard stated in the Proposal for "Structural Fill From On-Site Borrow Source". Measurement of placed fill material shall be made for determining on-site borrow quantities. Placement of unclassified excavation material shall not be included in on-site borrow quantities.

E. Compacted Clay Liner Subgrade

There shall be no measurement of compacted soil liner subgrade. Payment for construction of compacted clay liner subgrade shall be included in the unit price in the proposal for "compacted clay liner".

F. Fine Grading

Payment for fine grading shall be included in the unit prices bid in the Proposal for "Unclassified Excavation".

G. Access Road

Measurement of access road shall be performed along centerline of road. Payment shall be made at the unit price bid for the width access road called for on the plans. Payment shall be for installation of graded aggregate and geotextile fabric in accordance with these specifications and as shown on the plans.

H. Payments shall be full compensation for all work covered by this section, including but not limited to: excavating, and hauling anywhere within the property lines; removal of unsuitable material; embankment placement; disposal (including disposal of boulders); or stockpiling of materials; and formation/compaction of embankments, road or landfill subgrades, and shoulders.

PART 2 - PRODUCTS

2.01 SUITABLE MATERIAL

A. Shall be free from construction material, debris, frozen material, organic matter or unstable material.

B. Shall be suitable for the formation of embankments, subgrades, backfill, shoulders and other places requiring structural fill as may be indicated on the contract drawings or directed by the DESIGN ENGINEER.

C. No rock greater than 6 inches in diameter shall be placed in any portion of the landfill embankment. Small rock less than 6 inches, if used, shall be incorporated into the embankment in such a fashion to completely avoid bridging or voids.

2.02 UNSTABLE MATERIAL

The CQA ENGINEER will designate material unstable for the formation of embankments and subgrades. Unstable material may also be referred to as unsuitable. Moisture content of material alone shall not render material unstable or unsuitable. It is contractors responsibility to raise or lower material moisture content to achieve specified compaction densities or remove and replace at Contractor's expense.

2.03 UNSUITABLE MATERIAL

Areas deemed unstable or unsuitable by the CQA ENGINEER for subsequent embankment formation operations or other operations due to the presence of unstable or unsuitable materials as determined by proof rolling. Material shall be removed, replaced, and compacted using a suitable material.

2.04 BORROW EXCAVATION

Borrow material is available on site which is suitable for formation of embankment and subgrades as determined by the CQA ENGINEER, and shall be obtained from areas designated on the contract drawings.

2.05 CLAY LINER SUBGRADE

This area includes the designated thickness of compacted materials, to the limits indicated below the compacted clay liner.

2.06 SELECT SOILS FOR MUNICIPAL SOLID WASTE LANDFILL

The CQA ENGINEER shall classify soils suitable for compacted clay liner construction, drainage blanket (protective cover) and daily waste cover during the site excavation. The

B. Classification Tests:

Liquid Limit, Plastic Limit, and Plasticity Index will be determined in accordance with ASTM D4318. Sieve Analysis will be made as specified in ASTM D422.

C. Number of Density Tests:

The following tests will be performed and are considered to be the number of tests. Additional tests may be required contingent upon weather and/or soil conditions.

1. One (1) laboratory moisture-density relation test and companion classification test for each type of soil encountered.

2. A minimum of one density test shall be performed per 1000 cubic yards of fill subgrade and other embankment fills.

3.03 DRAINAGE

Satisfactory methods for dewatering and stormwater control during construction shall be installed as required. Cost of dewatering shall be included in the lump sum price in the proposal. The disposal of water after removal shall be in keeping with the intents of the soil erosion control plan.

3.04 GENERAL COMPACTION/FILL REQUIREMENTS

Excavation, fill and compaction requirements for this project vary as to the respective subgrade being constructed. Any subgrade not specifically detailed herein or any subgrade requirements that references this section shall meet the requirements of this section.

A. COMPACTION

1. When tested, embankment and fill material shall be compacted to not less than 95% Standard Proctor (ASTM D698) of the maximum dry density, or as specified in the schedule below. All subgrades will be proof-rolled prior to acceptance of subgrade by the CQA ENGINEER. Proof-rolling will be in accordance with procedures in section 3.01 of this specification. The number of tests shall be in accordance with Section 3.01, C.

DESCRIPTION	GENERAL COMPACTION	TOP 12"
Roadways	95%	98%
Shoulders & Embankments	95%	95%
Soil Liner*	95%	95%
Utilities Under Structures	95%	95%
Other Areas	90%	95%

*As Determined By Test Pad

2. If, in the opinion of the CQA ENGINEER (based upon testing reports, or inspection), subgrade or fills which have been placed are below specified density, the Contractor shall then provide additional compaction or repairs at no additional cost to Owner. Retests may be charged to the Contractor as determined by the CQA ENGINEER.

3. Subgrade materials shall be compacted at a moisture content within plus or minus 4% of optimum unless more or less moisture is allowed by the CQA ENGINEER. The Contractor shall dry or add moisture to the subgrade material when required to provide a uniformly compacted subgrade.

B. PROTECTION OF SUBGRADES

Stormwater conveyance channels and drains shall be provided and maintained when required to satisfactorily drain the subgrade. Where previously approved subgrade is damaged by natural causes, by hauling equipment, or by other traffic, the Contractor shall restore the subgrade to the required lines, grades, and typical sections and to the required density at no additional cost to the Owner.

C. EMBANKMENT FORMATION:

1. Areas to receive embankment formations or fill shall be stripped to suitable base material as required in Section 02110 - Clearing and Grubbing.

2. The material shall be deposited and spread in successive, uniform, approximately horizontal layers of not more than 10 inches in depth, loose measurement, for the full width of the cross section, and shall be kept approximately level by the use of effective spreading equipment. Each layer of the embankment shall be satisfactorily compacted as hereinafter specified.

3. Hauling shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form during the construction of the embankment. The embankment shall be properly drained at all times.

4. Where embankments are to be constructed across ground which will not support the weight of trucks or other hauling equipment, the first layer of the embankment may be constructed as a bridging lift by dumping successive truck or other equipment loads in a uniform distributed layer of a thickness not greater than that necessary to support the trucks or hauling equipment while placing subsequent layers. The remainder of such embankments shall then be constructed in layers as above specified.

5. When embankments are being constructed principally of rock, the depth of each layer shall be no greater than 36 inches. The rock shall be carefully distributed throughout the embankment and all voids shall be filled with fine material. The rock shall have a maximum particle size of no more than 2 feet. No rock lifts shall be placed within 3 feet vertically of the clay liner subgrade or roadway subgrade and shall only be placed in fill sections totaling greater than 6 feet nor shall rock be placed in proposed underground utility locations. Embankments for the landfill and stormwater basin shall use suitable material as defined in Part 2.00.

D. EMBANKMENT COMPACTION:

1. All embankment material shall be compacted to 95% Standard Proctor compaction unless otherwise provided in the Contract Documents or directed by the CQA ENGINEER. Compaction equipment used by the Contractor shall be adequate to produce the required compaction and produce a uniformly constructed embankment with all layers uniformly bound to all preceding layers.

2. Embankment materials shall be compacted at a moisture content within plus or minus 4% of optimum unless other moisture range is approved by the CQA ENGINEER. The Contractor shall dry or add moisture to the embankment material when required to provide a uniformly compacted and stable embankment.

3.05 GENERAL GRADING TOLERANCES

Grading tolerances shall be as specified below:

LANDFILL(S)

Soil Liner Subgrade (-0.1')

Compacted Soil Liner
- A. Rough Grading (+ 0 to 0.2')
- B. Fine Grading (+ 0 to 0.1')

Embankment (± 0.1')
Protective Cover (+ 0.1')

ROADWAYS AND STRUCTURES

Roadway Subgrade
- A. Rough Grading (± 0.12')
- B. Fine Grading (± 0.04')

Other
- A. Rough Grading (± 0.12')
- B. Fine Grading (± 0.04')

3.06 ROADWAY SUBGRADE

A. Preparation of Subgrade

The roadway subgrade shall be shaped to the lines, grades and typical sections shown on the plans. Where the CQA ENGINEER directs that areas of the subgrade are to

be stabilized, the subgrade surface in such areas may be left uniformly below grade to provide for the addition of the stabilizer material.

All unsuitable material, boulders, and all vegetative matter shall be removed and replaced with suitable material. Suitable material, when not available from the subgrade work, shall be taken from general excavation or borrow sources.

Material excavated in preparing the subgrade shall be stored or stockpile in such a manner as to not interfere with the proper drainage or any of the subsequent of placing base or pavement.

B. Compaction of Subgrade

When tested, fill material shall be compacted to not less than the following percent of the maximum dry density:

1. Under paved roads 95%; top 12 inches to 98%.

2. Under shoulders and stoned road 95%.

The subgrade shall be compacted at a moisture content which is approximately that required to produce the maximum density indicated. The Contractor shall dry or add moisture to the subgrade when required to provide a uniformly compacted and acceptable subgrade.

C. Protection of Subgrade

Ditches and drains shall be provided and maintained when required to satisfactorily drain the subgrade. Where previously approved subgrade is damaged by natural causes, by hauling equipment, or by other traffic, the Contractor shall restore the subgrade to the required lines, grades, and typical sections and to the required density at no cost to the Owner.

D. Rough Grading

The roadway subgrade surface shall be graded to within the specified tolerance of the grades indicated on the contract drawings. The final rough grade surface shall meet the compaction requirements and be graded and sealed to properly drain storm water prior to acceptance by the CQA ENGINEER.

E. Fine Grading

Contractor shall fine grade all roadway surfaces to within the specified tolerance of the grades indicated on the contract drawings. Compaction requirements shall be as described in Section 3.05.

3.07 LANDFILL CELL

The landfill cell shall be excavated to achieve the subgrade elevations equal to the specified liner thickness below the lines and grades indicated on the drawings as the top of clay elevation. The subgrade then shall be scarified to a depth of 6" and compacted to 95% Standard Proctor before acceptance and subsequent placement of the compacted soil liner.

Fine Grading:

Contractor shall fine grade the subgrade prior to placement of the soil liner.

3.08 BUILDING FOUNDATION SUBGRADES

Foundation subgrades shall be excavated to the lines and grades indicated on the plans. Footing subgrades shall be firm, backfill shall be to 95% of Standard Proctor at ±2% of optimum moisture content.

3.09 STOCKPILE AREAS

Surplus and unsuitable excavation shall be hauled, placed and sloped to drain for each material classification.

Material stockpile areas are indicated on the contract drawings. All excavation material shall be placed or stockpiled by one of the means listed below. All material types and classifications shall be subject to the interpretation of the CQA ENGINEER and shall be stockpiled or used for fill as directed by the CQA ENGINEER.

- Used for structural fill
- Stockpiled as topsoil
- Stockpiled as soil liner material
- Stockpiled as daily cover
- Stockpiled as drainage blanket (protective cover) material

Material stockpile areas for excess excavation shall be provided within 500 feet of the cell. No compaction of stockpiled material will be required.

3.10 MOISTURE CONTROL

Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compaction operations.

The Contractor shall furnish equipment for modifying the moisture content of the fill material and at times when the moisture content is not within the specified range, shall operate such equipment so as to achieve the necessary correction with minimum loss of time.

The addition of water shall be accomplished by methods which will distribute the added water evenly and in a controlled manner over the fill. Reduction in water content shall be accomplished by methods which are effective for promoting aeration of the fill material. No fill shall be placed until approved types of equipment for aeration and for addition of water are on the job and are demonstrated to be satisfactory of watering and/or dewatering operations.

During placement operations, Contractor shall keep surfaces from drying by addition of water or placement of additional materials.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Soil material 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 satisfactory value.

3.11 PROTECTION OF SUBGRADES AND FILL SURFACES

Newly graded areas shall be protected from traffic and erosion, and all settlement or washing away that may occur from all causes, prior to acceptance, shall be repaired and grades re-established to the required elevations and slopes. Embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained in such a manner as to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until sub-base, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted.

3.12 WORK ON EXISTING ROADWAY RIGHT-OF-WAY

All dirt spilled from the Contractor's trucks on existing pavements over which it is hauled or which has otherwise been deposited thereon shall be removed by the Contractor. Whenever, in the opinion of the Design ENGINEER, the accumulation is sufficient to cause the formation of mud, dust, interference with traffic, or create a hazard, the Contractor will be directed to remove such accumulations without delay. Existing site roadways used by the CONTRACTOR shall be restored to their preconstruction condition.

Shoulders of roadways shall be left in good, acceptable condition and all topsoil and grass that is disturbed shall be replaced.

--END OF SECTION--

SECTION 02220

TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.01 DESCRIPTION

The work under this Section includes all excavation, backfill, compaction, pavement removal, site restoration and cleanup for the construction of underground pipelines, and their related structures.

1.02 RELATED WORK

A. Section 02745 - Leachate Piping

1.03 DEFINITIONS

A. Pipeline Embedment:

1. Backfill material encasement extending from the full depth of bedding to a distance of twelve (12") inches above the top of the pipe.

2. Embedment is composed of bedding, initial backfill and foundation.

B. Foundation:

1. The load bearing portion of the embedment which underlines the bedding material.

2. Normally the excavated trench bottom except where unstable conditions exist and then alternate methods of foundation stabilization are required.

C. Bedding: Backfill material between a pipe and the foundation on which it rests.

D. Initial Backfill: Backfill placed from the top of the bedding and along the sides of the pipe to a distance of twelve (12") inches above the top of the pipe.

E. Final Backfill: Backfill placed from a distance of twelve (12") inches above the top of the pipe to the finished grade.

F. Embankment: Fill material placed above original ground surface to provide cover over a conduit which is fully or partially exposed.

G. Rock: Where "Rock" is used as the name of an excavated material, it shall mean boulders or pieces of rock, concrete or masonry measuring one (1) cubic yard or more, hard shale or solid ledge rock and masonry which, in the opinion of the CQA ENGINEER, requires for its removal the continuous use of pneumatic tools.

1.04 QUALITY ASSURANCE

A. Tests required by this section shall be performed by a qualified independent testing laboratory meeting the requirements of Section 01400.

B. The CONTRACTOR shall insure that all testing laboratory personnel contact the project representative prior to conducting tests to mutually select the test site. No testing shall commence without this contact.

C. All work shall comply with local development standards and state department of transportation specifications.

D. Regulatory Requirements:

1. Comply with applicable requirements of federal, state, and local laws, regulations and codes having jurisdiction at project site.

E. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the work of this Section.

1.05 SUBMITTALS

A. A minimum of two (2) copies of all test results shall be submitted to the CQA ENGINEER.

1.06 MEASUREMENT AND PAYMENT

No measurement will be made. Payment shall be included in the unit price bid in the Proposal for the work requiring trenching, backfilling, and compaction.

PART 2 PRODUCTS

2.01 BACKFILL MATERIAL

A. The requirements of this Article shall apply to all backfill materials unless otherwise specified.

B. All material shall be suitable and free from roots, wood, scrap material, and other vegetable matter and refuse.

C. Acceptable material shall generally be a natural or artificial mixture of soil types normally found in natural deposits in the project vicinity or material obtained from the CONTRACTOR's excavations.

D. All material shall be sufficiently dry for compaction and shall not contain excessive amounts of soft or highly plastic clays.

E. Maximum size of stone shall not exceed four (4") inches.

2.02 BEDDING MATERIAL

A. Fine granular bedding:

1. Materials for fine granular bedding shall consist of well graded fine to course sands or gravel meeting the gradation requirements of ASTM C 33 for fine aggregates.

2. Natural materials or artificial mixtures, consisting largely of a mixture of sand and clay, found in natural deposits in the project vicinity may be utilized as long as the material meets the proper proportions and gradation requirements.

3. The material shall generally pass a 3/8" sieve with no more than 10% passing a No. 100 sieve, and shall be non-plastic.

B. Gravel Bedding:

1. Materials used for gravel bedding shall consist of natural rounded or angular, graded stone or crushed rock, with little or no fines.

2. Generally, the aggregate size shall range from 1 1/2" to 3/8".

3. ASTM classification shall be No. 57 stone.

2.03 UNSUITABLE MATERIALS

A. General: Any material, which in the opinion of the CQA ENGINEER, contains vegetable matter, muck, roots, and rubbish shall be considered unsuitable.

B. The following, as defined in the United Soils Classification System, shall be considered the basis for classifying unsuitable material unless specifically noted in other sections of the specifications:

1. Highly plastic clay soils of the CH and MH descriptions.

2. Border line soils of the SC-CH description.
3. Organic soils of the OL and OH description.
4. Highly organic soils of the PT description.

PART 3 EXECUTION

3.01 SITE PREPARATION

A Clearing and Care of Surface Materials:

1. Topsoil shall be stockpiled at a suitable location so that it can be replaced.

B. Trees, plants, and existing structures and utilities shall be protected with appropriate barriers prior to construction.

3.02 GENERAL TRENCH EXCAVATION

A. The requirements of this Article shall apply to all trench excavation unless otherwise specified.

B. Trench excavation shall be of such depth to enable proper installation of embedment materials that will result in construction of the pipeline to the alignment and grade, or depth of cover, as shown on the Drawings.

1. Over-excavation and replacement of materials with proper bedding material shall be required where specified by the CQA ENGINEER.

2. If during the course of construction, the trench is inadvertently over-excavated, that area shall be backfilled with fine granular bedding material, unless gravel bedding is required where unsuitable materials are encountered in the subgrade or where specified by the CQA ENGINEER.

C. All such related structures and appurtenances shall be constructed to the alignment, grade, and position as shown on the Drawings.

D. In all cases where materials are deposited along open excavation they shall be placed so that in the event of rain, no damage will result to the work or adjacent property.

E. Unstable trench bottom:

1. Where an unstable trench bottom condition is encountered due to the presence of muck, quicksand, or other unsuitable materials, the unstable soil material shall be removed to a depth which is sufficient to produce a firm foundation.

2. The unstable soil material shall then be replaced with Class B embedment for the full depth of unstable material excavation.

3. The depth of unstable soil excavation and bedding replacement will be dependent upon the severity of the trench bottom soil conditions.

4. Depths of bedding shall be as a minimum those specified for Class B embedment,. contained in Article 3.07 (c) of this Section.

5. Alternate foundations shall be used where required as specified in Article 3.08 of this Section.

F. Regardless of the type of embedment used, all bell holes for bell and spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench or bedding material.

G. All bedding materials shall achieve the required densities by tamping with suitable tools and shaped to receive the pipe and support it at the exact elevation and line as shown on the Drawings.

H. Wet excavation:

1. Where the excavation area shown on the Drawings falls under the water surface near the banks of a flowing stream or other body of water or in high ground water areas, the CONTRACTOR may adopt and carry out any method he may deem feasible for the performance of the excavation work and for the protection of the work thereafter; provided the method and equipment to be used has received prior approval of the CQA ENGINEER.

2. During the selected method of construction, the excavation area shall be effectively protected from damage during the excavation period and until all contemplated construction work therein has been completed to the satisfaction of the CQA ENGINEER.

3. The cost of all temporary construction work necessary or incidental thereto, including the cost of installing and removing sand bags, coffer dams, sheet piling, excavation and backfill, pumping and dewatering, shall be considered as an integral part of the cost of excavation and no separate payment therefore shall be allowed or made.

I. Disposal of materials:

1. Disposal of waste materials and smoothing of disturbed material during trenching operations shall be performed as the pipe is laid and shall not be allowed to lag more than 500 feet behind the pipe laying operations.

2. All materials removed by excavation which are suitable for the purpose shall be used whenever practicable for backfilling pipe trenches, foundations and footings, and for such other purposes as may be shown on the Drawings or directed by the CQA ENGINEER.

3. All materials not used for backfilling, foundations, or footings shall be considered as waste materials and disposed of by the CONTRACTOR in an approved manner.

4. Waste materials may be deposited in spoil banks at locations as shown on the Drawings.

5. If no disposal areas are shown on the Drawings, the CONTRACTOR shall provide at his own expense disposal areas satisfactory to the CQA ENGINEER.

6. Waste materials shall not be left in unsightly piles, but shall be spread in uniform layers and neatly leveled and shaped.

7. Spoil banks shall be provided with adequate openings to permit surface drainage of adjacent lands.

8. On completion of any part of the work proper disposal shall be made of all surplus or unused materials left within the construction limits of such work and the surface of the work left in a neat and workmanlike condition.

3.03 WATER IN TRENCHES

A. Trenches shall be reasonably free from water while the pipes are being laid.

1. The CONTRACTOR shall remove and dispose of any water (including storm water), sewage, or any other liquid which may be found or may accumulate in the excavations.

2. This may be done by pumping, an adequate well point system, or other means of dewatering approved by the CQA ENGINEER.

B. The CONTRACTOR shall examine the site after excavating, and before proceeding with the work he shall notify the CQA ENGINEER of any evidence of water rising in such areas.

C. Static water levels shall be drawn down below the bottom of the excavation sufficiently to allow for placement of bedding and backfill.

1. Under certain conditions, the CQA ENGINEER may permit the CONTRACTOR to remove the water with the use of trenchside pumps through the use of an approved bedding.

2. The depth of bedding material will depend upon the amount of water, but care shall be taken to ensure that the trench wall soil material is such that it will not be removed from the area adjacent to the bedding.

D. The CONTRACTOR shall not open up more trench than the available pumping facilities are able to dewater.

E. The CONTRACTOR shall assume responsibility of disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working.

F. In no case shall the pipe lines be used as drains for such water, and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment.

G. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matters into the pipe lines, and on completion of the work, any such material which may have entered the pipe lines must be cleaned out so that the entire system will be left clean and unobstructed.

H. Release of groundwater to its static level shall be performed in a manner to maintain undisturbed state of natural foundation soils, prevent disturbance of compacted backfill or bedding, and prevent flotation of pipelines.

I. The CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, and shall have available at all times competent workmen for operation of pumping equipment.

J. Dewatering systems shall be designed and operated to prevent removal of natural soils and to prevent excessive reductions in the groundwater outside the excavation to the extent that it would damage or endanger adjacent structures or property.

3.04 ROCK EXCAVATION

A. Where rock is encountered in the process of trench excavation it shall be completely uncovered and stripped of all loose material over the area as specified herein.

B. Rock shall be excavated in accordance with Section 02211 Rock Excavation.

C. Ledge rock, boulders, and large stones shall be removed to provide a clearance of not less than six (6") inches in every horizontal direction from all parts of pipe, fittings, and other appurtenances.

D. Where rock is encountered at grade in trenches, the trench shall be excavated not less than six (6") inches below the bottom of the pipe bell, refilled with fine, granular material thoroughly tamped in-place and shaped to the pipe.

E. Excavated rock shall not be mixed with material selected for tamped backfilling under and around the pipe or up to a level at least two (2') feet above the pipe.

3.05 TRENCH SIZE

A. Gravity piping:

1. As soil conditions will permit, the sides of trenches shall be cut in vertical, parallel planes from the bottom of the trench to the top of the pipe and have maximum width of two (2') feet plus the outside diameter of the pipe as shown on the Drawings.

2. The width of the remaining depth of the trench may be as wide as necessary except as restricted by limits of right-of-way or existing improvements that are to be protected; the sides, however, shall be as nearly vertical as practicable or allowable.

3. If the trench width from the bottom of the trench to the top of the pipe is over-excavated in excess of that specified, sewers shall be laid on a gravel bedding at no extra cost to the OWNER.

B. Pressure Piping:

1. Trenches for pressure piping shall provide a minimum of 30 inches cover over the barrel of the pipe, except as otherwise shown.

2. Width of trench at and below top of the pipe shall not exceed twelve (12") inches on either side of pipe.

3. Width of trench above top of pipe may be as wide as necessary within limits of right-of-way, with banks as nearly vertical as practicable or allowable, and except as restricted by existing improvements, that are to be protected.

3.06 EXCAVATION FOR APPURTENANCES AND STRUCTURES

A. Excavation for appurtenances shall be made to a size that will allow at least twelve (12") inches between the outer surfaces of the appurtenance and the excavation wall or shoring.

B. Excavation for precast manholes and other precast structures shall be undercut six (6") inches below the bottom of the precast structure and shall be backfilled with gravel bedding as specified under the bedding material in this section.

C. Undercutting and providing a bedding for structures shall be considered as an integral part of the work and no separate payment shall be allowed or made.

3.07 EMBEDMENT OF PIPE

A. Pipeline embedment shall consist of all bedding materials, including concrete, foundation and initial backfill as shown on the Drawings.

B. Class A Embedment:

1. Concrete Cradle: The pipe shall be embedded in a monolithic cradle of plain or reinforced concrete.

a. The minimum thickness shall be one-fourth (1/4) the inside pipe diameter or a minimum of four (4") inches under the barrel and extending up the sides for a height equal to one-fourth (1/4) the outside diameter.

b. The cradle shall have a width at least equal to the outside diameter of the pipe barrel plus eight (8") inches or poured to the full width of the trench.

2. Concrete arch: The pipe shall be embedded in carefully compacted gravel bedding with a monolithic plain or reinforced concrete arch.

a. The gravel bedding shall have a thickness of one-fourth (1/4) the outside diameter or three (3") inches minimum between the barrel and bottom of trench excavation extending to the springline of the pipe.

b. The concrete arch shall have a minimum thickness of one-fourth (1/4) the inside diameter at the crown and have a minimum width equal to the outside pipe diameter plus eight (8") inches or poured to the full width of the trench.

C. Class B Embedment:

1. Class B embedment shall be used where an unstable trench bottom condition is encountered or where established by the CQA ENGINEER or where shown on the Drawings.

2. The pipe shall be laid on gravel bedding placed on a flat trench.

3. The gravel bedding shall have a minimum thickness of one-fourth (1/4) the outside pipe diameter.

4. The gravel bedding shall extend to the springline of the pipe barrel, or one-half (1/2) the outside diameter of the pipe.

D. Class C Embedment:

1. Class C embedment shall be used as the normal or ordinary embedment and shall be used unless unstable trench conditions are present or where otherwise shown on the Drawings.

2. The pipe shall be embedded in fine granular material on a trench bottom which shall be level in cross-section except that a continuous trough shall be shaped in the bedding which will fit the pipe barrel with reasonable closeness.

3. The bedding shall have a minimum thickness beneath the pipe of six (6") inches or one-eighth (1/8) of the outside diameter of the pipe, whichever is greater.

4. The bedding shall extend up the sides of the pipe one-sixth (1/6) of the outside diameter of the pipe.

E. Initial backfill material, which is from the bedding to one (1') foot above the pipe:

1. Shall be carefully deposited in successive horizontal layers of not more than twelve (12") inches in loose depth on each side of the pipe.

2. Shall be thoroughly and carefully tamped or rammed around the pipe with approved tools until reaching a minimum cover of not less than one (1') foot over the top of the pipe.

3.08 ALTERNATE FOUNDATIONS

A. Where the bottom of the trench is found to consist of material which is unstable to such a degree that, in the opinion of the CQA ENGINEER, it cannot be removed and replaced with an adequate bedding material, alternative foundations methods may be required.

B. The CQA ENGINEER may require, depending upon the severity of the unstable soil, to provide special foundations such as piling, concrete mats (or a combination thereof), sheeting with keyed-in plank foundation, or other means of stabilization.

C. The type of alternative foundation methods shall be constructed in accordance with the Drawings or as approved by the CQA ENGINEER.

D. Should additional instructions or Detailed Drawings be required; they will be furnished in accordance with the Supplemental General Conditions.

3.09 BACKFILLING TRENCHES

A. The backfilling of sewer or other pipe line trenches shall be started immediately after the pipe work and embedment preparation has been inspected by the CQA ENGINEER.

B. Final backfill material, which if from a height of one (1') foot above the pipeline upward:

1. Shall be backfilled in well compacted layers.

2. If the trench extends along or across streets, roadways, useable alleys, or sidewalks or any areas to be paved in new construction, the remainder of the trench shall be backfilled and tamped to its full depth in the manner specified for initial backfill.

3. Shall be backfilled in the manner specified for initial backfill where indicated on the Drawings.

C. Placement of backfill material in layers greater than twelve (12") inches loose fill shall require prior approval of compaction methods and equipment.

D. All backfilling shall be done in such manner as will not disturb or injure the pipe or structure over or against which it is being placed.

E. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be opened up and repaired and then re-backfilled as herein specified.

F. Where excavation has been made, the top one (1') foot of backfill material shall consist of fine, loose earth free from large clods, vegetable matter, debris, stone, or other objectionable materials.

G. Temporary surfaces:

1. Where pipe trenches are cut across or along existing pavement, the CONTRACTOR shall construct a temporary surface over the cut by filling and tamping the upper six (6") inches of the cut with selected gravel, crushed stone or reef which will not disintegrate under traffic and which shall be

maintained in good condition under traffic until the permanent pavement has been constructed.

2. No specific payment will be allowed for temporary surfacing.

3.10 COMPACTION AND TESTING

A. Compaction and testing for quality control shall be in conformance with Section 01400 and the Specific requirements of this Section.

B. Minimum tests required on all materials to prove compliance with the specifications shall be as follows:

1. A determination of soil classification, sieve analysis, maximum dry density as per ASTM D-698 and optimum moisture content shall be made from each material source.

2. In-place density test shall be made on all materials under roadways, streets, useable alleys, or other similar areas as required by the CQA ENGINEER.

C. Compaction requirements:

1. Unless otherwise specifically noted elsewhere in these Specifications or on the Drawings, material shall meet the following compaction requirements.

a. Bedding and initial backfill material shall be well compacted.

b. Final backfill and embankments shall be compacted to a density equal to or greater than the surrounding undisturbed soil.

c. Compaction on total (initial & final) backfill and base material under roadways shall meet density requirements as indicated on the Drawings.

d. Embedment shall be well compacted.

2. The theoretical maximum density shall be arrived at in the manner prescribed under applicable documents.

3. Material containing excessive moisture shall not be placed.

4. Its placement may be delayed until it has dried out to the proper moisture content, or it may be thoroughly mixed with a drier material to obtain the desired water content.

5. Material with insufficient moisture shall be wetted sufficiently before compaction to obtain the desired moisture content.

6. Adequate equipment for furnishing and sprinkling water shall be kept available at all times during the progress of the work.

--END OF SECTION--

SECTION 02250

COMPACTED CLAY LINER

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, material, supervision, and equipment to complete the Compacted Clay Liner for the cell, including hauling, discing, compacting, drying, removal of rainfall and removal of all previously placed material unsuitable due to weather conditions, final grading and sealing and all necessary and incidental items as detailed or required to complete the compacted liner, all in accordance with the plans and specifications.

1.02 MEASUREMENT AND PAYMENT

A. Measurement shall be made by survey or field measurement and computed by the DESIGN ENGINEER in cubic yards with the quantity for payment being the product of the surface area and the required thickness (24") of the clay liner. This quantity shall not include the volume required for normal benching as detailed on the Construction Drawings, replacement volumes for areas that have become unsuitable due to weather or the overfill thickness required for erosion protection.

B. Clay liner placed beyond the limits of the lines and grades as shown on the Construction Drawings will not be accepted and must be removed, if directed by the DESIGN ENGINEER, at the CONTRACTOR's expense.

C. The entire Compacted Clay Liner must meet or exceed the specified thickness, density and permeability requirements prior to payment.

D. Payment for work shall be made on the unit price bid per cubic yard of Compacted Clay Liner in the Proposal.

1.03 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with the requirements of Section 01400 Quality Control and the testing program requirements of this section.

B. A representative of the CQA ENGINEER shall be present at all times during clay liner construction activities.

PART 2 PRODUCTS

2.01 CLAY LINER MATERIAL

A. Clay that meets all of the following requirements shall be classified as select clay fill for use in construction of the secure cell compacted clay liner.

1. Clay shall be classified according to the Unified Soil Classification System (USCS) as ML, MH, or CL (ASTM D2487-83). Liquid limit, plasticity index (PI), and percent passing the No. 200 sieve will be considered for proper classification.

2. Select clay fill materials shall be reasonably free of gypsum, ferrous, and/or calcareous concretions and nodules, refuse, roots, or other deleterious substances.

3. Continuous and repeated visual inspection of the materials being used will be performed by the CONTRACTOR to ensure proper soils are being used. In addition, the CQA ENGINEER shall make frequent inspections of the liner placement operations and materials, and will consult with the site personnel on suitable liner materials and locations of such.

4. The compacted clay liner shall be compact, uniform, smooth, and substantially free of debris, rock, plant materials, and other foreign material. The clay liner shall meet the following criteria:

UPPER 6" CLAY LINER

Percentage Of Material Passing (by weight)	Screen Size
95% (all tests)	1"
100% (avg. of all tests)	3"

LOWER 18" CLAY LINER

Percentage Of Material Passing (by weight)	Screen Size
100% (avg. of all tests)	3"

PART 3 - EXECUTION

3.01 TEST PAD

A. A test pad shall be constructed prior to beginning installation of the compacted clay liner. A separate pad shall be constructed for each soil exhibiting a significant change in material properties as determined by the CQA ENGINEER

B. The test pad shall be constructed at a location selected by the CQA ENGINEER. The location, subgrade slope, equipment, liner thickness, lift thickness, and subgrade condition shall be representative of full scale construction. The test pad shall be constructed in accordance with Section 3.03 - Construction of Compacted Clay Liner.

C. The test pad shall have a minimum surface area of 600 square feet (± 20' x 30') or as directed by the CQA ENGINEER. For each of four (4) lifts, a minimum of three test locations shall be established for testing moisture content, density and a composite sample for recompacted lab permeability. At least one shelby tube sample for lab permeability testing shall be obtained per lift.

3 proctor / lift

4 LFT → 12 proctor

D. Acceptance and rejection criteria shall be verified in accordance with the tests specified for full scale construction.

(1) K test on shelby/undisturb sample / 1 LFT

→ 4 K test for test pad

3.02 SUBBASE PREPARATION

A. The 6" in-situ composite liner subbase for the composite liner clay base shall be compacted to 95% (or as otherwise directed by the CQA ENGINEER) as determined by the Standard Proctor Test, ASTM D698. The composite liner subbase shall be free of rocks, roots, stumps, and other debris.

3.03 CONSTRUCTION OF COMPACTED CLAY LINER

A. Select clay fill lift thickness (after compaction) shall be no greater than 6 in. Thinner lifts are permissible to achieve design grade.

B. Prior to compaction, each lift of select clay fill material shall be thoroughly disced to a depth of 4". Equipment or truck trafficking of the surface shall not be permitted during the period between scarifying and placement of the following lift.

C. After scarifying, representative samples will be taken by the CQA ENGINEER and tested for moisture content prior to any compactive efforts. If the moisture content is within the range specified in F below, compaction may begin. If the moisture content is outside of this range, the select clay fill will be wetted or dried and reworked accordingly. The select fill should be sprinkled or sprayed with water (from a water truck) and dozed, wind-rowed, and/or disc-plowed to uniformly increase the moisture content of the clay if the material is below Optimum Moisture Content (OMC). The select clay fill should be dozed, wind-rowed, and/or disc-plowed to help air dry the clay if the moisture content is too high.

D. Each lift will be thoroughly compacted and must satisfy moisture and density controls through field testing before a subsequent lift is placed.

E. Compaction of lifts shall be as follows:

1. Compaction of lifts shall be performed with an appropriately heavy, properly ballasted penetrating-foot compactor (such as a CAT 815 or equivalent) subject to approval of the CQA ENGINEER. A minimum of six passes will be required on each lift regardless of whether the lift meets density specifications. A pass is defined as one trip of the compacting equipment over the lift and back to the starting point by a single drum roller or one trip across the lift surface from one side to the other if the compacting equipment has front and back compacting rollers. This requirement is to allow thorough remolding of the clay by kneading action and to reduce clod size. Clod size shall not exceed one-half of the lift thickness. The final lift shall have clods no larger than one inch.

2. The daily work area shall extend a distance no greater than necessary to maintain moist soil conditions (facilitate bonding) and continuous operations. Desiccation and crusting of the lift s[illegible] allowed. The surface shall be continuously sprinkled with [illegible] enance.

3. If desiccation and crusting of the lif[illegible] ent of the next lift, this area shall be sprinkled [illegible] and tested for water content to ensure uniform [illegible] acement of a subsequent lift.

4. Transition from full depth liner to beginning of adjacent new section shall be accomplished by sloping (cutting back) the end of a full depth section at 5H:1V (horizontal to vertical) or flatter for tying in a new lift.

5. The cell bottom shall be constructed initially and completed over the width of the base before beginning the slope. The transition between the bottom and side slopes shall be accomplished by compacting parallel to the slope by running up and down the slope.

6. Dozer or scraper equipment shall not be used for primary compaction efforts, except as specified in (C.) above.

F. During compaction, the placement soil moisture content and dry density shall be maintained within the limits specified below.

1. To confirm that the moisture content and dry density requirements of the compacted soil are being satisfied, field and laboratory tests on drive tube (ASTM D2937) samples shall be made at locations designated by the CQA ENGINEER at the frequency specified in section II.F. of the CQA Manual.

2. Compaction moisture content shall be at least 2 percent wet of OMC or wetter as required by the CQA ENGINEER. Should wetter material be used, the CQA ENGINEER may allow density reduction as appropriate.

G. The select fill shall be compacted to a minimum dry density of 95 percent (or as determined by test strip) of the maximum dry density determined by the Standard Proctor Test, ASTM D698. Densities less than 95 percent of the maximum dry density determined from the Standard Proctor Test shall be recompacted and/or removed and reworked to meet density objectives. In addition, the compacted materials dry density/moisture content shall lie within the 90 percent saturation line, to be established from tested specific gravities.

H. The compacted clay liner shall have a maximum permeability of 1.0×10^{-7} cm/sec as determined by ASTM D5084-90. One (1) sample per acre per each lift of compacted clay liner component will be selected by the CQA ENGINEER for permeability testing (ASTM D5084-90). ok

I. No select fill shall be placed or compacted during sustained periods of temperatures below 32°F. Select fill may not be placed during freezing conditions.

J. During construction, finished lifts or sections of compacted clay liner must be sprinkled with water as needed to prevent drying and desiccation.

K. At the end of each construction day's activities, completed lifts or sections of compacted clay liner shall be sealed by rolling with a rubber tired or smooth drum rollers and sprinkled with water as needed.

L. The compacted clay liner shall be 24 inches thick across the bottom and up the sideslopes of the cell. Thickness of the clay liner on the sideslopes shall be measured perpendicular to the slope face. ok ck the sideslope ?

$H_{(thickness)} = \frac{\Delta V_{surveyor\ data}}{\cos \alpha}$ → slope angle

M. Perforations in the compacted clay liner resulting from sampling or testing procedures, survey stakes or other activities shall be identified and backfilled by the CQA ENGINEER. The perforations shall be filled with a soil-bentonite mix consisting of 10% minimum by weight bentonite powder or granules mixed with clay liner material. The perforations shall be backfilled with the soil-bentonite mixture in 3-inch loose lifts and thoroughly compacted by hand tamping by the CQA ENGINEER.

N. The as-built thickness of the compacted clay liner shall be determined by non-destructive survey methods as described below. Samples of the in-place compacted clay liner shall be tested and evaluated prior to acceptance.

O. After completion of a segment (one landfill cell) of compacted clay liner, but <u>before</u> installation of the geomembrane liner, the top of the clay shall be surveyed to ensure:

1. The specified thickness of compacted clay liner has been achieved.

2. The top of the clay liner slopes diagonally across the cell toward the collection assembly at grades specified on the Contract Drawings; and

3. The top of the clay liner in the collection assembly area is at the grades and elevations specified on the Contract Drawings.

4. Clay liner placed beyond the limits of the lines and grades as shown on the Contract Drawings will not be accepted and must be removed at the Contractor's expense. Such material which has been determined suitable for liner construction may be re-incorporated into liner if needed.

5. This work shall be performed by a surveyor registered in the State the services will be performed in and shall be provided by the OWNER.

--END OF SECTION--

SECTION 02253

PROTECTIVE COVER - ON LINER - NATIVE SANDY SOILS

PART 1 - GENERAL

1.01 SCOPE OF WORK

This section covers the material and placement of the protective cover system for the base liner system.

1.02 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with the requirements of Section 01400 Quality Control and the testing program requirements of this section.

B. A representative of the CQA ENGINEER shall be present at all times during soil cover construction activities.

1.03 RELATED WORK

A. Section 02747 - Leachate Collection System

amount of native sandy soil shape area : cy must provide to the report

1.04 MEASUREMENT AND PAYMENT

A. Measurement shall be made by survey or field measurement and computed by the DESIGN ENGINEER in cubic yards with the quantity for payment being the product of the surface area and the required thickness (24") of the protective cover.

B. Protective cover placed beyond the limits of the lines and grades as shown on the Construction Drawings will not be accepted and must be removed, if directed by the DESIGN ENGINEER, at the Contractor's expense.

C. The entire Protective Cover must meet or exceed the specified thickness requirements prior to payment.

D. Payment for work shall be made on the unit price bid per cubic yard for Protective Cover Native Sandy Soils in the Proposal.

PART 2 - PRODUCTS

2.01 SOIL COVER MATERIAL

A. Soil that meets all of the following requirements shall be classified as select protective cover native sandy soils for use in construction of the liner protective cover.

1. Soil shall be classified according to the United Soil Classification System (USCS) as CL, ML, SW, SP, SM, or SC (ASTM D2487-83). Liquid limit, plasticity index (PI), and percent passing the No. 200 sieve will be considered for proper classification.

   Construction Quality Assurance shall meet the following minimum requirements:

Test	Minimum Frequency	Criteria
Permeability (ASTM D2434)	3,000 yd^3	$k \geq 1x10^{-3}$ cm/sec

2. Soil materials shall be reasonably free of gypsum, ferrous, and/or calcareous concretions and nodules, refuse, roots, or other deleterious substances.

3. Continuous and repeated visual inspection of the materials being used will be performed by the CQA ENGINEER to ensure proper soils are being used. In addition, the CQAENGINEER shall make frequent inspections of the placement operations and materials, and will consult with the site personnel on suitable materials and locations of such. All material shall be taken from select sources or stockpiles.

4. The protective cover native sandy soils shall be uniform, smooth, and reasonably free of debris, rock, plant materials, and other foreign material larger than ¾ inch in diameter. The material should contain no sharp edges.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF PROTECTIVE COVER

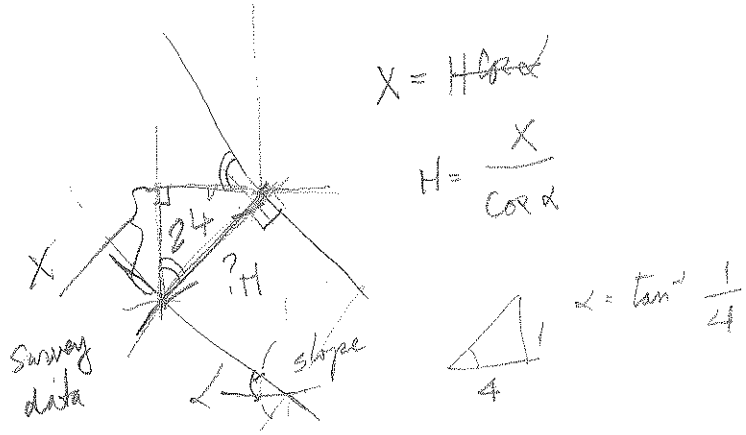
A. Soil for the cover shall be placed and spread with light weight rubber-tired or tracked equipment. All tracked equipment used in placement of the protective soil cover shall be low ground pressure equipment having a ground contact pressure less than 6 psi. Tracked equipment must be operated in such a manner that sharp turns that cause dragging of the tracks over the protective cover are minimized. When spreading, the soil shall be stockpiled at depths of a minimum four feet and thence

spread to the thickness indicated utilizing light weight rubber-tired or track equipment, so as not to damage the low permeability soil liner.

B. The soil cover on the floor and side slopes shall be 24 inches thick. The thickness shall be measured perpendicular to the slope of face.

C. After completion of the protective cover, the liner system shall be surveyed to ensure the specified thickness has been achieved.

--END OF SECTION--



PART 2 PRODUCTS

2.01 WASHED SAND COVER MATERIAL

Material for the washed sand (protective cover) shall be a loose granular material resulting from the disintegration of rocks, shall be capable of 98% passage through a 1/2" screen and shall have no more than 5% by weight passing the No. 200 sieve. The protective cover material shall contain no aggregate rocks, debris, plant material, material with sharp edges, lignite, coal, ash, or carbonaceous material. By-products of industrial processes, with the exception of quarry grinding operations, shall not be accepted. The washed sand (protective cover) material shall have a permeability of not less than $1x10^{-2}$ cm/sec.

Construction Quality Assurance shall meet the minimum requirements for the Granular Drainage Media as follows:

Test	Minimum Frequency	Criteria
Grain size to No. 200 sieve (ASTM D 422)	1,500 yd^3	≤ 1/2"
Permeability (ASTM D 2434)	3,000 yd^3	$K \geq 1x10^{-2}$ cm/sec

PART 3 EXECUTION

3.01 CONSTRUCTION OF PROTECTIVE COVER

A. Sand for the cover shall be placed and spread with light weight rubber tired or tracked equipment. All tracked equipment used in placement of the protective soil cover shall be low ground pressure equipment having a ground contact pressure less than six (6) psi. Tracked equipment must be operated in such a manner that sharp turns that cause dragging of the tracks over the protective cover are minimized. When spreading, the material shall be stockpiled at depths of a minimum four feet and thence spread to the thickness indicated utilizing light weight rubber tired or track equipment so as not to damage the geomembrane liner.

B. The washed sand on the floor and side slopes shall be 24 inches thick. The thickness shall be measured perpendicular to the slope of face.

C. After completion of the protective cover, the liner system shall be surveyed to ensure the specified thickness has been achieved.

D. Any damage to the geomembrane shall be repaired in accordance with Section 02750 HDPE Geomembrane Liner and under the direction of the Engineer.

--END OF SECTION--

SECTION 02745

LEACHATE PIPING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. This section covers the materials and the installation of all leachate piping.

1.02 RELATED WORK

A. Section 02220 - Trenching, Backfilling and Compaction
Section 02747 - Leachate Collection System

B. Drawings and general provisions of Contract, including General and Supplementary Conditions, and Detailed Specification Sections, apply to work specified in this section.

1.03 QUALITY ASSURANCE

Quality Assurance shall be in accordance with Section 01400, Quality Control and the Construction Quality Assurance Manual.

1.04 APPLICABLE PUBLICATIONS AND STANDARDS

American Society for Testing and Materials (ASTM Publications)

ASTM D256	Test Methods For Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D638	Test Method For Tensile Properties of Plastics
ASTM D696	Test Method For Coefficient of Line at Thermal Expansion of Plastics
ASTM D746	Test Method For Brittleness Temperature of Plastics and Elastomers By Impact
ASTM D1238	Test Method For Flow Rates of Thermoplastics By Extrusion Plastometer
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1505	Test Method For Density of Plastics By The Density-Gradient Technique

ASTM D1525	Test Method For Vicat Softening Temperature of Plastics
ASTM D1693	Test Method For Environmental Stress Cracking of Ethylene Plastics
ASTM D2240	Test Method For Rubber Property - Durometer Hardness
ASTM D2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM D2412	External Loading Properties of Plastic Pipe by Parallel - Plate Loading
ASTM D2837	Obtaining Hydrostatic Design Basis For Thermoplastic Pipe Materials
ASTM D3350	Polyethylene Plastics Pipe and Fittings Materials also Gasket for push-on Joints

1.05 SUBMITTAL REQUIREMENTS

A. All submittals shall be clearly marked as to what is being provided. Submittals not so marked shall be returned. Contractor shall submit shop drawings with the following information on each of the pipe types provided:

1. indicate compliance with applicable ASTM standard
2. unit weight
3. SDR
4. diameter
5. physical dimensions
6. method of jointing with instructions
7. nominal pipe joint lengths
8. recommended bedding and installation details
9. instructions and tables or information on strength of each pipe type versus bury conditions of depth and traffic loadings

B. Manufacturer's certificate of compliance.

The DESIGN ENGINEER requires certified lab data from the manufacturer to verify the physical properties of the materials supplied under this specification and at the Owner's expense may take random samples for testing by an independent laboratory. The DESIGN ENGINEER REQUIRES CERTIFICATION that the pipe produced is represented by the quality assurance data.

1.06 MEASUREMENT AND PAYMENT

A. General

Payment shall constitute full compensation for furnishing of all products, tools, equipment, dewatering services, testing and all incidentals necessary to complete the work as required in this Section of the Specifications.

B. Perforated Leachate Collection Pipe

See Section 02747 - Leachate Collection System

See 02748 for material requirements for HDPE pipe

C. Solid Leachate Collection Pipe

1. Measurement shall be along the centerline of the piping. No deductions shall be made for space occupied by valves, manholes, or fittings.

2. Payment will be made for piping at the Contract unit price per linear foot (LF) for the various types and sizes of the piping, complete.

D. Leachate Pipe Cleanout

1. Leachate pipe cleanouts including caps, and grading shall be measured by each actually installed.

2. Payment shall be made by the unit price in the Proposal for each actually installed.

PART 2 PRODUCTS

2.01 PIPE SCHEDULE

Function	SDR	Diameter	Type	Minimum Pipe Length
Perforated Leachate Collection Pipe	11.0	4", 8"	HDPE Smooth Wall	40 Feet
Solid Leachate Collection Pipe	11.0	8"	HDPE Smooth Wall	40 Feet
Force Main	11.0 17	6" Carrier 10" Container	HDPE Dual Containment	40 Feet
Force Main	11.0 17	2" Carrier 4" Container	HDPE Dual Containment	40 Feet
Sump Riser	17	24"	HDPE Smooth Wall	40 Feet
Miscellaneous Piping	As Noted on Drawings			

2.02 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. Pipe and Fittings Resin

The pipe supplied under this specification shall be high performance, very high molecular weight, high density polyethylene pipe. All pipe and fitting resins shall be manufactured by the same company which manufactures the pipe itself in accordance with these specifications to ensure complete resin compatibility and total product accountability. The fittings supplied under this specification shall be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe.

B. Resin physical properties shall comply with the Plastic Pipe Institute (PPI) recommended material Designation PE 3408 and conform to Material Cell Classification (ASTM D3350) or 345464C.

C. Standards

Polyethylene pipe and fittings shall meet all the requirements of NSF listed pipe but are not required to be NSF listed.

D. Quality Control

The resin used for the manufacture of the pipe shall be manufactured by the pipe manufacturer, thus maintaining complete control of the pipe quality. The pipe shall contain no recycled compound except that which is generated in the manufacturer's own plant form the same raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects, and shall be identifiable in color, density, melt flow and other physical properties throughout.

The polyethylene resin used shall have all ingredients precompounded prior to extrusion of pipe. In-plant blending is not acceptable.

The DESGIN ENGINEER REQUIRES CERTIFICATION that the pipe produced is represented by the quality assurance data. Additionally, test results from the manufacturer's testing which show the pipe does not meet appropriate ASTM standards of manufacturer's representation, will be cause for rejection of the pipe represented by the testing. These tests may include density and flow rate measurements form samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM 3350, 10.1.9.

E. The CQA ENGINEER requires certified lab data from the manufacturer to verify the physical properties of the materials supplied under this specification and at Owner's expense may take random samples for testing by an independent laboratory.

3.03 REPAIR OF DAMAGED SECTIONS

A. Polyethylene Pipe (HDPE)

Sections of polyethylene pipe having cuts or gouges in excess of 10% of the wall thickness of the pipe shall be removed. New polyethylene pipe section shall be rejoined using the butt fusion joining method. It is the DESING ENGINEER's intent to reduce the number of joints. The CQA ENGINEER shall reject pipe installations where in his opinion installation methodology of Contractor does not meet this objective.

3.04 PIPE JOINING

A. Perforated and Non-Perforated Leachate Pipe (HDPE)

Sections of polyethylene pipe and fittings shall be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed by qualified persons and in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment and fusion pressures. Pipe will be fused at approximately 500°F with 150 psi fusion pressure.

3.05 HANDLING OF FUSED PIPE

Fused segments of polyethylene pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable type chokers must be avoided. Nylon slings are required. Spreader bars are recommended when lifting long fused sections. Care shall be exercised to avoid cutting or gouging the pipe.

3.06 TRENCHING AND BACKFILL

Leachate collection pipe shall be laid as detailed in the construction drawings. Force main and gravity pipe (outside the cell) shall be laid in accordance with Section 02220 - Trenching, Backfill and Compaction.

3.07 HDPE PIPE CLEANOUTS

HDPE pipe cleanouts shall be installed as detailed on the contract drawings.

3.08 INSPECTION AND ACCEPTANCE

All work shall be subject to inspection and approval prior to final acceptance and payment. Final acceptance shall be contingent upon the following:

A. Owner accepts polyethylene pipe installation when the installation is finished, all testing results are satisfactory, installation documentation and site inspection is completed, and pipes have been flushed.

B. Contractor shall clean by water flushing all HDPE pipe beginning at cleanouts. Lines shall be flushed until completely free of debris. Contractor shall recover and remove all debris from system and dispose of in an environmentally safe manner.

C. Final cleanup shall meet the approval of the CQA ENGINEER and the Owner.

--END OF SECTION--

SECTION 02747

LEACHATE COLLECTION SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish all labor, material, supervision, and equipment to complete the perforated leachate piping collection systems for the cells including collection piping, gravel, and geotextile.

1.02 RELATED WORK

A. Section 02745 - Leachate Piping
B. Section 02253 - Protective Cover - On Liner - Native Sandy Soils
C. Section 02255 – Protective Cover – Washed Sand
D. Section 02757 - Geotextile

1.03 MEASUREMENT AND PAYMENT

A. Measurement of the leachate collection system shall be along the centerline of the piping.

B. Payment shall be made by the unit price bid for the stated size of perforated leachate pipe and shall include installation of pipe, gravel, and geotextile fabric as called for on the plans.

1.04 QUALITY ASSURANCE

A. Quality assurance shall be in accordance with the requirements of Section 01400 Quality Control and the testing program requirements of this section.

PART 2 PRODUCTS

2.01 LEACHATE COLLECTION PIPING

A. Leachate collection piping shall be in accordance with Section 02745 - Leachate Piping.

2.02 GRAVEL

Gravel for encasing leachate pipe shall be a clean washed hard non-carbonaceous mineral such as granite. Gravel size shall be No. 57 in accordance with ASTM D448-86.

2.03 TRANSITION FILTER

Gravel for the transition filter shall be a clean, washed, hard, non-carbonaceous mineral such as quartz. Gravel size shall be No. 89 in accordance with ASTM D448-86 or NC DOT size No. 78M.

2.04 CUSHION GEOTEXTILE FABRIC

Geotextile shall be a 24 oz./s.y. non-woven geotextile of polypropylene fibers or polyester yarns which is intended to be and shall be suitable for cushion and separation.

2.05 GEOTEXTILE FABRIC SOCK

Geotextile shall be a 6.0 oz./s.y. non-woven geotextile of polypropylene fibers or polyester yarns which is intended to be and shall be suitable for filtration and separation.

PART 3 EXECUTION

3.01 INSTALLATION

A. The leachate collection system shall be installed in accordance with the construction details in the contract drawings. The leachate pipe shall be embedded in gravel with the gravel providing separation of the pipe from the protective cover.

B. The OWNER shall provide the services of a Registered Land Surveyor to certify that the thickness of the material required by the plans and specifications is actually in place. This surveyor shall also prepare an "As-Built" drawing of the site which shows the in-place location of the collection system.

Fig 3 as-built protective cover

--END OF SECTION--

SECTION 02748

HDPE FABRICATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

This section cover the materials and fabrication of HDPE structures used for penetration assemblies.

1.02 RELATED WORK

A. Section 02745 - Leachate Piping

1.03 QUALITY ASSURANCE

The resin used for the manufacture of the pipe and plate products shall be manufactured by the producer of the products, thus maintaining complete control of the quality. The products shall contain no recycled compound except that which is generated in the manufacturer's own plant from the same raw material. The products shall be homogenous throughout and free of visible cracks, holes, foreign inclusions or other deleterious defects, and shall be identifiable in color, density, and other physical properties throughout.

The manufacturer shall provide certification that the products produced are represented by the quality assurance data.

1.04 APPLICABLE PUBLICATIONS AND STANDARDS

American Society for Testing and Materials (ASTM Publications)

ASTM D256	Test Methods For Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D638	Test Method For Tensile Properties of Plastics
ASTM D696	Test Method For Coefficient of Line at Thermal Expansion of Plastics
ASTM D746	Test Method For Brittleness Temperature of Plastics and Elastomers By Impact
ASTM D1238	Test Method For Flow Rates of Thermoplastics By Extrusion Plastometer

ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1505	Test Method For Density of Plastics By the Density-Gradient Technique.
ASTM D1525	Test Method For Vicat Softening Temperature of Plastics
ASTM D1693	Test Method For Environmental Stress Cracking of Ethylene Plastics
ASTM D2240	Test Method For Rubber Property - Durometer Hardness
ASTM D2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM D2412	External Loading Properties of Plastic Pipe by Parallel - Plate Loading
ASTM D2837	Obtaining Hydrostatic Design Basis For Thermoplastic Pipe Materials
ASTM D3350	Polyethylene Plastics Pipe and Fittings Materials also Gasket for push-on Joints

1.05 SUBMITTAL REQUIREMENTS

Submittals on fabricated products shall be clearly marked as to what is being provided. CONTRACTOR shall submit fabricator's shop drawings with the following information on each product provided:

1. indicate compliance with applicable ASTM Standard
2. unit weight of material
3. physical dimensions including material thickness
4. method of joining
5. recommended bedding and installation details
6. anti-flotation anchor requirements

1.06 MEASUREMENT AND PAYMENT

A. No measurement shall be made for "HDPE Fabrication".

B. Payment for work or products required in this section shall be included in the unit/lump sum price bid in the Proposal for the item to which the work in this section applies.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS

A. Pipe: The pipe shall be in accordance with Section 02745 - Leachate Piping. The pipe shall be made of high density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D-1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials. Clean rework material generated by the manufacturer's own production may be used so long as the pipe or fittings produced meet all the requirements of this specification. The pipe shall be Spirolite as manufactured by Chevron Chemical Company or equal.

B. HDPE Plate: Plate used for fabrication shall be made of the same high density, high molecular weight polyethylene material used for pipe to insure compatibility of polyethylene resins in the fabrication process.

2.02 FABRICATION

A. Experience: Products shall be constructed by a fabricator or manufacturer with at least five (5) years experience in the construction of products similar to those being provided.

B. Joining: Pipe and plate material shall be joined by the extrusion weld method or the butt fusion method in strict accordance with the manufacturer's recommendations. The equipment used in the joining procedures shall be capable of meeting all conditions of the pipe or plate material manufacturer.

C. Stub-outs: Products shall have HDPE pipe penetrations and stub-outs for flange or butt fusion connections as shown in the construction plans. Penetrations shall be extrusion welded to the wall of the product. All stub-outs and penetrations shall be installed by the manufacturer or fabricator.

D. Testing: Structures shall be tested in accordance with Section 01666 - Testing Piping Systems, and certification shall be provided OWNER.

PART 3 - EXECUTION

3.01 INSTALLATION

Fabricated products shall be installed in accordance with the fabricator's / manufacturer's recommendations and as shown in the plans.

--END OF SECTION--

SECTION 02750

HDPE GEOMEMBRANE LINER
(NOT IN THIS CONTRACT)

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, supervision and equipment to complete the installation of the HDPE Geomembrane Liner, including, but not limited to, liner layout, seaming, patching, and all necessary and incidental items required to complete the Work, in accordance with the Contract Drawings and these Specifications.

B. Sufficient liner and fabric material shall be furnished to cover all lined areas shown on the Drawings, including overlaps at field seams and anchor trenches.

C. It is the intent of these Specifications to ensure a quality finished product. It shall be the responsibility of the CONTRACTOR to ensure that this requirement is met.

1.02 QUALITY

A. The CONTRACTOR will be required to submit a quality control program to the CQA ENGINEER prior to initiating field work.

B. The OWNER shall employ and pay for the services of a third-party CQA Firm, in accordance with Section 01400 - Quality Control, to confirm the installation of the liners.

C. All installation procedures and testing shall be in accordance with these Specifications and OWNER's Independent Construction Quality Assurance (CQA) Manual (attached).

D. All field destructive and non-destructive testing will be performed by the CONTRACTOR. Samples for laboratory testing will be taken by the CONTRACTOR for testing at the CONTRACTOR's laboratory as well as the CQA ENGINEER's laboratory.

1.03 SUBMITTALS

A. The geomembrane and geotextile fabric manufacturers shall submit certification that all sheets manufactured for the Project have been produced in accordance with these Specifications along with results from a quality control program. This information

must be submitted for review prior to material delivery. The CQA ENGINEER reserves the right to halt installation until proper certification is submitted and determined acceptable for use.

B. The CONTRACTOR shall submit to the CQA ENGINEER, six (6) full sets of panel layout construction drawings. Field welds and panels shall have an identification system. Drawings shall be submitted to the CQA ENGINEER at least two (2) weeks prior to installation.

C. The manufacturer of the geomembrane used in this work shall approve all shop drawings and a proposed liner layout to cover the lined area shown on the Drawings.

D. Details shall be included to show the termination of the liner at the perimeter of lined areas, the methods of sealing around penetrations and methods of anchoring.

E. The CONTRACTOR shall submit to the CQA ENGINEER a physical sample of the liner and fabric to be used. The samples shall be labeled with the manufacturer's name, product identification, lot number and roll number.

F. The CONTRACTOR shall also submit to the CQA ENGINEER inventory tickets, roll numbers or batch identifications, packing papers and invoices for the liner and fabric used.

G. The CONTRACTOR shall provide personnel resumes demonstrating compliance with the following requirements:

1. A minimum of one (1) field superintendent per shift shall be designated by the CONTRACTOR and approved by the CQA ENGINEER. Each field superintendent shall have a minimum of three years and five million square feet of field experience in installing HDPE geomembranes. Any change or replacement of superintendent during the Project must be approved by the CQA ENGINEER.

2. The weld technicians shall have a minimum of one year and one million square feet HDPE geomembrane welding experience.

1.04 MEASUREMENT AND PAYMENT

A. Payment for work shall be made on the Unit Price bid per square foot of in-place geomembrane liner. Pay limits shall be measured to the upper inside corner of all anchor trenches.

B. All testing, patches, repairs, material in the anchor trenches, waste, overlap, and material beyond the required pay limits will be considered incidental to the construction and will be excluded from payment. All materials and work required of

the CONTRACTOR for excavation, backfill, and compaction of the anchor trench are also considered incidental to the installation and will also not be included as pay items.

C. Payment quantities will be determined by the DESIGN ENGINEER. No payment shall be made until liner is actually installed and the state accepts the certification of the CQA Firm.

1.05 WARRANTY

A. Material

The MANUFACTURER is responsible for guaranteeing its product. The warranty shall include all that is listed below:

1. Shall begin at the time of issuance of CQA ENGINEER's Certification of Substantial Completion.

2. The material shall be free from defects and be able to withstand normal weathering and use from the date of installation for a period of 20 years under normal uses and services for which it is designed and manufactured.

3. This limited warranty does not include damages or defects resulting from acts of God, casualty or catastrophe such as, but not limited to earthquake, flood, piercing hail, tornado.

4. "Normal Use" excludes: exposure to harmful chemicals, mechanical abuse by machinery, equipment, or people, excessive pressure beyond that indicated by the final overburden or municipal refuse and cover indicated on the drawings.

PART 2 - PRODUCTS

2.01 GEOMEMBRANE LINER

A. The geomembrane shall comprise HDPE material manufactured of new, first-quality products designed and manufactured specifically for the purpose of municipal waste leachate containment in sanitary landfills.

B. The geomembrane material shall be so produced as to be free of holes, blisters, undispersed raw materials or any sign of contamination by foreign matter. Any such defect shall be repaired in accordance with the manufacturer's recommendations. The DESIGN ENGINEER or CQA ENGINEER may reject all or portions of units (or rolls) of geomembrane if significant quantities of production flaws are observed.

C. The geomembrane material shall meet the material properties as specified in Table 1.

D. The geomembrane liner shall be the required nominal liner thickness as shown on the drawings.

E. If natural colored, the manufacturer shall add carbon black per ASTM D 1248 Specifications, Section 3.1.2.3, Class C.

F. The manufacturer's quality control program shall include the following inspections and tests:

1. Inspection for: Appearance on both sides, manufacturing defects, and thickness at 10 random locations across each sample strip. Thickness measured shall be within ±0.006 inches of the average thickness of the strip.

2. Testing shall be conducted in accordance with Table 1 and the results reported.

2.02 PACKAGING AND STORAGE

A. The geomembrane shall be shipped rolled. Folded or otherwise creased liner will not be accepted. The liner shall be marked and tagged with the following information:

1. Serial Number
2. Resin Type
3. Roll Length
4. Gross Weight
5. Inspected By
6. Date of Manufacture
7. Resin Lot Number
8. Roll Width
9. Net Weight

B. Liner which has been delivered to the Project site shall be stored in a dry area and protected from precipitation and direct sunlight.

C. Care shall be taken to keep the materials clean and free from debris prior to installation.

PART 3 - EXECUTION

3.01 GENERAL

App G

The geomembrane liner shall be constructed as soon as practical after completion of the compacted clay liner and after certification in writing of the compacted clay liner by the CQA ENGINEER and the CONTRACTOR. The geomembrane liner shall be installed following the manufacturer's printed recommendations, using sound, accepted engineering practices.

All liner installation shall be completed by one crew and shall be installed in no more than 30 calendar days from the date of initiation of installation. The installing crew shall be approved by the manufacturer/fabricator for installation of 60 mil HDPE synthetic liners.

A manufacturer's technical representative shall be at the Preconstruction Conference and on site at the time of installation.

A. Geomembrane Liner

1. No horizontal seams are allowed within five (5) feet of the toe of the slope.

2. Unroll only those factory-packaged sections which are to be anchored or seamed together in one day. Panels should be positioned with the overlap recommended by the manufacturer, but not less than two (2) inches.

3. After panels are initially in place, remove as many wrinkles as possible. Unroll several panels and allow the liner to "relax" before beginning field seaming. The purpose of this is to make the edges which are to bonded as smooth and free of wrinkles as possible.

4. Once panels are in-place and smooth, commence field seaming operations.

5. No support equipment used by any CONTRACTOR shall be allowed on the geomembrane. Personnel working on the geomembrane shall not smoke, wear damaging shoes or engage in any activity which damages the geomembrane.

6. The anchor trench shall be excavated, backfilled and compacted. Care should be taken when backfilling the trench to prevent any damage to the geomembrane.

7. Damaged and sample coupon areas of geomembrane shall be repaired by the CONTRACTOR. Any damage to the soil / clay Liner Component while coupons are open is the responsibility of the CONTRACTOR. Repaired areas will be tested for seam integrity by the CONTRACTOR. Damaged materials are the property of the CONTRACTOR and will be removed from the site at the CONTRACTOR's expense. The CONTRACTOR will retain all ownership and responsibility for the geomembrane until acceptance by the OWNER.

3.02 SEAMING

A. Geomembrane Liner

1. Field Seaming

a. All foreign matter (dirt, water, oil, etc) shall be removed from the area to be bonded. If the seam is to be bonded by the extrusion process, the bonding surfaces must be thoroughly cleaned by mechanical abrasion or alternate methods approved by the CQA ENGINEER to remove surface cure and prepare the surfaces for bonding. No solvents shall be used to clean the geomembrane liner.

b. As much as practical, field seaming shall start in the middle and work toward an open end in order to minimize cutting and patching of large wrinkles that become trapped. When seaming the side slopes, seaming should start at the toe of the slope and work up the slope. Tack welds, if used, shall use heat only; no double-sided tape, glue or other method will be permitted. The geomembrane should be seamed completely to the ends of all panels to minimize the potential of tear propagation along the seam. Seaming of the bottom membrane to the sidewall membrane shall be conducted when conditions minimize thermal expansion effects. The completed liner shall not exhibit "trampolining" and shall be in full contact with the underlying soil liner.

c. At the end of each day or installation segment, all unseamed edges shall be anchored by sand bags or other approved device. Sand bags shall weigh approximately 20 pounds and shall be placed no further apart than 20 foot spacing along the open end of the geomembrane. Sand bags securing the geomembrane on the side slopes should be connected by a rope fastened at the top of the slope by a temporary anchor. If high winds are expected, boards along the edge of unseamed panels, with weighted sand bags on top, should be used to anchor the geomembrane on the bottom of the cell. Sand bags fastened by rope should be used to secure unseamed edges on the side slopes. Staples, U-shaped rods, or other penetrating anchors shall not be used to secure the geomembrane. The temporary anchoring of the geomembrane is fully the responsibility of the CONTRACTOR. Any material damaged as the result of weather effects, shall be repaired or replaced at no cost to the OWNER.

d. It is imperative to keep surface water runoff from beneath the geomembrane at all times during installation. The CONTRACTOR's panel placement and seam welding technique and welding schedule

shall minimize or eliminate the accumulation of water beneath the geomembrane. Any water found ponded beneath the geomembrane after the geomembrane has been installed shall be removed by the CONTRACTOR at no cost to the OWNER. Any compacted soil liner beneath installed geomembrane that has become excessively moist, soft or unsuitable to perform its intended function shall be replaced at no cost to the OWNER.

e. After field seaming is complete in a given area, liner edges in the anchor trench should be buried. Do not bury the liner edge in the anchor trench within 30 feet of an incomplete or unbounded field seam.

2. Field seaming may be extrusion or fusion welding or a combination of these methods. Solvent welding is not acceptable. The DESIGN ENGINEER or CQA ENGINEER reserves the right to reject any proposed seaming method believed unacceptable.

a. Extrusion welding applies a molten bead of material to preheated sheets of geomembrane. The sheets are then joined by pressure.

b. The fusion welding process heats the area to be joined to the melting point and then applies pressure to join the melted surfaces.

c. The sheets to be joined shall be overlapped at least two (2) inches after the necessary aligning and cutting.

d. In general, seams should be oriented parallel to the line of maximum slope, i.e., oriented up and down, not across, the slope. In corners and odd shaped geometric locations, the number of field seams should be minimized.

e. No horizontal seams should be within five (5) feet from the toe of the slope.

f. No seaming should be attempted above 40 degrees C (104 degrees F) ambient air temperature. Below five degrees C (41 degrees F) ambient air temperature, preheating of the geomembrane may be required. It shall be the responsibility of the CONTRACTOR to demonstrate that conditions are favorable for seaming by acceptable test (start-up) seams which duplicate, as closely as possible, actual field conditions. Preheating may be achieved by natural and/or artificial means (shelters and heating devices).

g. A moveable protective layer of plastic may be required, as recommended by the CQA ENGINEER, to be placed directly below each overlap of geomembrane that is to be seamed. This is to prevent any moisture build-up between the sheets to be welded.

h. Seaming will extend to the outside edge of panels to be placed in anchor trenches.

i. If required, a firm substrata should be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

j. Grinding prior to welding shall be as recommended by the geomembrane manufacturer and shall be done perpendicular to the sheet edge. Overground or improperly ground areas shall be replaced at the CONTRACTOR's expense.

k. No folds, wrinkles or "fish-mouths" shall be allowed within the seam area. Where wrinkles or folds occur, the material shall be cut, overlapped and an extrusion-weld shall be applied. During wrinkle or fold repairs, adjacent geomembrane may not necessarily be required to meet the two (2) inch minimum overlap, if approved by the CQA ENGINEER. All welds on completion of the work shall be tightly bonded and sealed.

3.03 TESTING OF HDPE GEOMEMBRANE

A. General

1. Samples of the field seams shall be taken and tested in accordance with ASTM D6392 ensure that tensile strength at yield and break, elongation at yield and break meet the minimum specifications. A quality control certificate shall be issued with the material.

2. The CONTRACTOR shall employ on-site physical non-destructive testing on all welds.

3. A quality control technician employed by the CONTRACTOR shall inspect each sheet and seam. Any area showing a defect shall be marked and repaired in accordance with HDPE repair procedures.

B. Test Seams: Test seams will be made each day prior to commencing field seaming. These seams will be made on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. Such test seams will be made at the beginning of each seaming period and, at the CQA ENGINEER's discretion, at least once every

four (4) hours, for each seaming apparatus used that day. Also, each seamer will make at least one (1) test seam each day. The test seam shall be made using the same geomembrane used in production seaming.

1. The test seam sample will be at least 1.5 m (5 feet) long by 0.3 m (1 foot) wide with the seam centered lengthwise. Ten (10) adjoining specimens 25 mm (1-inch) wide each will be die cut from the test seam sample. These specimens, which will be tested with a tensiometer in the field for shear (five samples) and peel (five samples) by the CONTRACTOR and witnessed by the CQA ENGINEER, should not fail in the seam. If a test seam fails, the entire operation will be repeated. If the additional test seam fails, the seaming apparatus or seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two (2) consecutive successful full test seams are achieved. Test seam failure is defined as failure of any one of the specimens tested in shear or peel.

2. The CQA ENGINEER will observe all test seam procedures. The remainder of the successful test seam sample will be assigned a number and marked accordingly by the CQA ENGINEER, who will also log the date, hour, ambient temperature, number of seaming unit, name of seamer and pass or fail description. At least one (1) tested specimen from each test as selected by the CQA ENGINEER will be retained by the CQA ENGINEER. The CQA ENGINEER will transmit these specimens to the OWNER following acceptance of the geomembrane materials and installation by the OWNER.

3. The criteria for determining a passing seam shall be the properties shown in Table 2 of the attached CQA Manual.

C. Field Seams: Field seams will be tested by the CONTRACTOR continuously using non-destructive techniques and at specified intervals using destructive tests. Requirements for non-destructive and destructive testing are as follows:

1. Single Weld Seams: The CONTRACTOR shall maintain and use equipment and personnel at the site to perform continuous vacuum box testing on all single weld production seams or when the geometry of the weld makes pressure testing impractical.

a. Equipment for Vacuum Testing:

1. Vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, 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.

b. Procedure for Vacuum Testing:

1. Trim excess overlap from seam, if any.

2. Turn on the vacuum pump to reduce the vacuum box to approximately five (5) inches of mercury, i.e., three (3) psi gauge.

3. Apply a generous amount of solution of strong 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 three inches Hg. 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 not less than five (5) seconds, examine the composite liner FML 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 (3) inch overlap, and repeat the process.

10. Mark all areas where soap bubbles appear and repair the marked areas. After repairs are made, retest these areas.

2. Double Weld Seams: The CONTRACTOR shall maintain and use equipment and personnel to perform air pressure testing of all double weld seams. The system shall be capable of applying a pressure of at least 30 psi for not less than five minutes. The CONTRACTOR shall perform all

pressure and vacuum testing under the supervision of the CQA ENGINEER. Pressure loss tests shall be conducted in accordance with the procedures outlined in "Pressurized Air Channel Test for Dual Seamed Geomembranes", Geosynthetic Research Institute Test Method GM-6. As outlined by the test method, following a two minute pressurized stabilization period, pressure losses over a measurement period of five (5) minutes shall not exceed the following: 40 mil - 4 psi, 60 mil - 3 psi, 80 mil - 2 psi.

37 psi

3. Destructive testing will be performed on an average of every 500 linear feet of field seam. The locations will be selected by the CQA ENGINEER. Sufficient size samples will be obtained by the CONTRACTOR to provide one sample to the archive, one sample to the CQA ENGINEER for laboratory testing, and two samples to be retained by the CONTRACTOR for both field and laboratory testing. Testing requirements are as follows: Each sample shall be large enough to test five (5) specimens in peel and five specimens in shear. The criteria for passing seams is shown in Table 2 of the attached CQA Manual. If unresolved discrepancies exist between the CQA ENGINEER's and CONTRACTOR's test results, the archived sample may be tested by the CQA ENGINEER. Samples which do not pass the shear and peel tests will be re-sampled from locations at least 10 feet on each side of the original location. These two re-test samples must pass both shear and peel testing. If these two samples do not pass, then additional samples will continue to be obtained until the questionable seam area is defined.

The CQA ENGINEER will observe all production seam field test procedures. The remainder of the successful test seam sample will be assigned a number and marked accordingly by the CQA ENGINEER, who will also log the date, seam number, approximate location in the seam, and field test pass-or-fail description, if applicable. The CQA ENGINEER will be responsible for the archive specimen.

3.04 REPAIRS

A. Repair of failing test seams, damage from pressure testing and sample coupons: Damaged and sample coupon areas, and other damaged areas of geomembrane shall be repaired by the CONTRACTOR by construction of a cap strip. No repairs shall be made to seams by application of an extrusion bead to a seam edge previously welded by integrity. Damaged materials are the property of the CONTRACTOR and will be removed from the site at the CONTRACTOR's expense.

B. Make repairs as follows:

1. Abrade surfaces of the geomembrane that are to be repaired no more than 20 minutes prior to the repair,

2. Clean and dry all geomembrane surface immediately prior to repair,

3. Only use approved seaming equipment,

4. Extend patches or caps at least 6 inches beyond the edge of the defect, and round corners of patches to a radius of at least 3 inches, and

5. Cut the geomembrane below large caps to avoid potential for water and gas collection between the two sheets.

3.05 ANCHOR TRENCH BACKFILLING

The anchor trench will be backfilled and compacted to a dry density not less than 90 percent of the maximum dry density determined by the Standard Proctor (ASTM D-698). Care should be taken when backfilling the trench to prevent any damage to the geomembrane. Anchor trench spoil shall be used as backfill material, wherever possible.

3.06 PROTECTION OF LEADING EDGES

Between construction of partial sections of the membrane liner, leading edges of the membrane may be exposed or buried for extended periods of time prior to their joining to adjacent, subsequent membrane sections. The combined action of abrasive soil and equipment impact stresses may "etch" unprotected membrane surfaces sufficiently to affect seam strengths. Therefore, it is necessary to protect leading edges in high activity areas with sacrificial layers of HDPE sheet until they are ready for final seaming. As a minimum, each leading edge to be seamed that must be buried or which must be exposed for periods of one (1) month or longer shall be continuously covered by a layer of geotextile overlain by a layer of HDPE sheet. The geotextile shall be non-woven and have a minimum weight of 6 oz. per square yard. The sacrificial HDPE sheet shall have a minimum thickness equal to that of the membrane liner to be protected. Both protective cover sheets layers shall have a minimum width of two feet. The protective cover sheets shall be either covered with soil or weighted with sand bags to prevent displacement by wind. The edge of the sheet to be protected shall be approximately centered beneath the overlying protective layers prior to burial or weighing with sandbags. Leading edges located in areas expected to receive direct traffic from construction equipment shall be buried under a minimum thickness of one foot of buffer soil.

3.07 HDPE LINER ACCEPTANCE

The CONTRACTOR shall retain ownership and responsibility for the geosynthetic lining system until acceptance by the OWNER.

The lining system shall be accepted by the OWNER when:

- The installation is complete as determined by the CQA ENGINEER;

- Verification of the adequacy of all seams and repairs, including associated testing, is complete;

- All documentation of installation is completed, including all CQA reports;

- The CONTRACTOR provides the OWNER with record drawings of the panel layout and seam locations with reference numbers for test locations;

- The CONTRACTOR, the Manufacturer and the CQA ENGINEER provide written certification that the installation was in accordance with the manufacturer's general recommendations, the OWNER's CQA plan, and specifications, with exceptions noted.

TABLE 1

REQUIRED PHYSICAL PROPERTIES OF GEOMEMBRANE LINER (HDPE) SHEET

PROPERTY	TEST METHOD	REQUIRED VALUES 60 MIL	FREQUENCY
Thickness, Mil. (min.)[1]	ASTM D5199 (Smooth)	60 (lowest individual measurement)	Per Roll
	ASTM D5994 (Textured)	60 (lowest individual measurement)	Per Roll
Sheet Density, g/cm^3 (min. ave.)	ASTM D792 or ASTM D1505	0.940	200,000 lbs.[3]
Tensile Properties (min. ave.) (Each Direction)	ASTM D6693 (GRI GM-13)		20,000 lbs.
Strength at Yield (1 lb/in)		126	
Elongational Yield (%)		12	
Strength at Break (1 lb/in)		228(90)[2]	
Elongation at Break (%)		700(100)[2]	
Tear Resistance, 1 lbs. (min. ave.)	ASTM D1004	42	45,000 lbs.[4]
Stress Crack Resistance	ASTM D5397	300 hrs.	per GRI GM 10
Puncture Resistance, lbs. (min.)	ASTM 4833	108 (90)[2]	45,000 lbs.[4]
Carbon Black Content, (Allowable Range in %)	ASTM D1603 or ASTM D4218	2.0 - 3.0	20,000 lbs.[4]
Carbon Black Dispersion, (Acceptable Levels)	ASTM D5596	GRI GM13	45,000 lbs.[4]
Asperity (textured only) (MARV)	GRI Test Method GM12	10	every 2nd roll

1 Thickness - value represents lowest individual value.

2 Value in parenthesis represents minimum value for textured sheet where it differs from smooth sheet value.

3 pounds of resin

4 pounds of geomembrane

--- END OF SECTION —

SECTION 02757

GEOTEXTILE
(NOT IN THIS CONTRACT)

PART 1 - DESCRIPTION

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for the installation of the geotextile layer, as specified herein, as shown on the Drawings, and in accordance with the Construction Quality Assurance (CQA) Plan.

B. The Contractor shall be prepared to install the geotextile in conjunction with the earthwork and other components of the liner system.

1.02 REFERENCES

(Note: For geotextile test standards please refer to the current ASTM Annual Book of ASTM Standards, Volume 04.08 Section 4 for the Latest version of the American Society for Testing and Materials (ASTM) Standards.)

PART 2 - PRODUCTS

2.01 MATERIALS

A. This section sets forth the requirements for geotextiles.

B. Physical Properties

The geotextile shall be manufactured using a spunbonded process in which continuous polypropylene filaments are mechanically needled to produce a non-woven geotextile. Manufacturer's certification shall be required stating the geotextile has been inspected for broken needles. This inspection shall be via metal detectors permanently installed on-line at the production facility.

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The geotextile shall meet or exceed the properties listed in Table 1. Unless noted otherwise, all numerical values indicate minimum average roll values (i.e., test results from any sampled roll in the lot, when tested in accordance with ASTM D 4759-88 shall meet or exceed the minimum average roll value listed). All strength values are for the weaker principle direction.

TABLE 1

Physical Property	Test Method	Unit	Minimum Value
Mass Per Unit Area (nominal)	ASTM D 3776	oz/sy	6.0
Puncture Resistance	ASTM D4833	lbs.	95.00

ASTM - American Society for Testing and Materials

C. Submittals

Prior to bid, the contractor shall submit the geotextile manufacturer's specification sheet(s) which indicate the property values of the product(s) that are submitted for use on the project. A swatch (12" x 12") of each geotextile shall be submitted along with the specification sheets.

Prior to arrival of the geotextile(s) on site, upon request the geotextile manufacturer shall supply quality control/quality assurance documents to the owner's representative.

Quality control/quality assurance sampling and testing shall be conducted in accordance with ASTM D 4354 and applicable test standards as found in Table 1. Recommended tests and test frequencies are found in Table 2.

TABLE 2

Property	Minimum Frequency
Mass Per Unit Area	every 100,000 ft^2
Puncture Resistance	every 400,000 ft^2

Additional Supporting Documentation: Contractor shall supply additional documentation which shall include: supporting test date and EPA 9090 test data which will assist the DESIGN ENGINEER in determining the suitability of the geotextile for the intended application.

D. Plant Inspection

A representative of the owner may visit the manufacturing plant at any time during the project to observe and inspect the manufacturing process and quality control monitoring, sampling and testing. The owner will notify the Contractor at least forty-eight (48) hours in advance of the intended visit. The Contractor shall be responsible for making all necessary arrangements for the visit with the manufacturer. All costs of travel, lodging and meals incurred by the owner's representative will be borne by the owner.

2.02 SHIPPING, STORAGE AND HANDLING

A. General

Geotextile shall be shipped, stored and handled in accordance with ASTM D 4873, and as specified herein. Contractor shall be completely responsible for shipping, storage and handling of all geotextiles.

B. Roll Identification

Each roll shall be labeled (by printing directly on the geotextile) or tagged with roll identification number, lot identification number, name of manufacturer, product type and grade, and physical dimensions. The label or tag information shall be affixed or attached to the roll at all times during deployment of the roll. The roll identification number and manufacturer name shall also be marked on the protective covering.

C. Shipping

Geotextile shall be shipped and stored in opaque protective covering. Contractor shall notify the CQA ENGINEER at least 24 hours prior to schedule delivery. No materials shall be unloaded without the presence of the owner's representative. Geotextile(s) delivered to the site shall be inspected for damage, unloaded and stored with minimal handling. Contractor shall assist the owner's representative in conducting inventory, handling and sampling of geotextile at no additional cost to the owner.

D. Handling

No hooks, tongs or other sharp tools or instruments shall be used for handling geotextile roll(s). Contractor shall use slings or a pole which extends a minimum of 1 foot beyond each end to unload or handle individual rolls. Geotextile shall not be dragged along the ground.

E. Site Storage

Geotextile roll(s) whose protective covering has been damaged during handling shall be protected from ultraviolet light exposure, precipitation or other inundation, soil, mud, dirt, debris, puncture, cutting or other damaging or deleterious conditions. Geotextile shall not be stored directly on the ground.

2.03 CONFORMANCE TESTING

A. Sampling Procedures

Upon delivery to the site, samples of the geotextile(s) shall be removed and sent to a laboratory, chosen by the owner, for testing to ensure conformance to these Specifications. Samples shall be selected by the owner's representative in accordance with these Specifications. Conformance testing, as detailed, in 1.05B, shall be at the rate of two per lot or one per 100,000 ft^2 (10,000 m^2), whichever results in the greater number of samples.

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B. Interpretation of Conformance Test Results

Test specimens will be obtained from each conformance sample. The minimum number of specimens tested per conformance sample for each tested geotextile property will be determined in accordance with the respective ASTM Standard. The average value will be calculated from the specimen test values of each conformance sample and compared to the minimum average roll value of the tested geotextile property. A conformance sample that yields an average number which is less than the specified minimum average roll property, will be recorded as a failure. If two conformance samples fail, all rolls within the sampled 100,000 square feet or lot will be rejected for use on the project unless the manufacturer would like to have additional testing performed at no cost to the owner. If only one (1) conformance test fails, the roll that yielded the failure will be rejected and a subsequent conformance sampled from the same 100,000 square feet or lot will be tested. All rolls within the sampled 100,000 square feet or lot will be rejected for use on the project if the subsequent conformance test fails. Only the roll which yielded a failure will be rejected from use on the project if the subsequent conformance test passes.

2.04 GEOTEXTILE INSPECTION

A. Material Inspection

The Contractor shall visually inspect all geotextile rolls for imperfections, faulty areas and possible damage prior to installation. All defective rolls shall be marked and repaired in accordance with approved methods.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Placement

Geotextile(s) shall be installed as shown on the drawings, approved installation drawings, and as specified herein or in accordance with the approved installation

procedures. No geotextile roll shall be installed without approval of the CQA ENGINEER. Geotextile rolls shall be placed in such a manner as to minimize field sewing.

Geotextile shall be cut only with an approved geotextile cutter.

All changes to approved installation drawings and procedures shall be approved by the CQA ENGINEER prior to implementation.

The Contractor shall exercise extreme care during geotextile installation to prevent damage to the prepared supporting subgrade surface or to other installed geosynthetics. The Contractor shall exercise care to prevent the entrapment of rocks, clods of earth or other matter which could damage the geotextile or other geosynthetic, clog the geotextile or hamper seaming. Any geotextile surface showing damage to penetration by foreign objects or distress shall be replaced or repaired.

No foot traffic shall be allowed on the geotextile except with approved smooth - sole shoes. No vehicular traffic shall be allowed on the geotextile. The Contractor shall not use the geotextile as a work area or storage area for tools and supplies.

The CQA ENGINEER shall have the authority to order the immediate stoppage of work as a result of improper installation procedures or for any reason which may result in detective and improper installation.

Cleanup within the work area shall be an ongoing responsibility of the Contractor. Particular care shall be taken to ensure that no trash, tools or other materials are trapped beneath the geotextile.

B. Repairs

Geotextile repairs shall be made with patches of the same geotextile material, using approved sewing systems, equipment and techniques. The patch size shall be 24 inches larger in all directions that the area to be repaired. All corners shall be rounded. All stitches shall be located no closer than 1 inch from the edge of the patch.

C. Joining Methods

Thread used to sew panels of geotextiles together shall be UV stabilized polypropylene. The tread color shall contrast with the geotextile color to assist in inspection of the seam.

Geotextile seams shall be prayer or flat seams for non-woven geotextiles. All seams shall be formed by mating the edges of the geotextile panels, and sewn together with continuous stitches located a minimum of 3 inches from the mated edges. A two - thread, type 401k double - locked stitch shall be used for all sewing work. Sewing

procedures shall conform to the latest procedures recommended by the geotextile manufacturer. Thermal welding can also be performed on geotextiles with mass per unit area greater than 7.9 ounces per square yard. For both forms of seaming the contractor shall demonstrate that the seam efficiency meets requirements found in Table 1.

D. Cover

All geotextile should be covered within 14 days. If the geotextile will be left exposed for more than 14 days, the manufacturer, prior to shipping, shall provide field U.V. test data and written recommendations for the maximum time of U.V. exposure. Geotextiles which will be left exposed for more than 14 days shall be routinely sampled and tested for tensile strengths every 4 weeks. Sampled should be taken from the exposed geotextile and these areas properly repaired. If within the time frame of recommended exposure the tensile strength of the geotextile falls below 80% of the original values, the manufacturer shall replace the detective material assuming all cost for removal of the detective material and installation of the replacement material.

E. Socks

Geotextile fabric socks for wrapping pipe shall be constructed with the fabric specified in this section. The sock shall be constructed by forming a cylinder and stitching the seam in accordance with the joining methods specified in this section. The sock diameter shall be sufficient size to slip easily over the pipe and connecting sleeve.

- END OF SECTION -

SECTION 02930

GRASSING

PART 1 GENERAL

1.01 WORK INCLUDED

Provide seedbed preparation, liming, fertilizing, seeding, and mulching of all newly graded finish earth surfaces, unless indicated otherwise, and all areas inside or outside the limits of construction that are disturbed by the Contractor's operation. Areas shall be hydroseeded, except small areas that are inaccessible to the hydroseeding equipment, which shall be drilled seedbed.

1.02 SUBMITTALS

A. Contractor shall furnish Certificates of Conformance from manufacturers or agencies.

1. Seed
2. Fertilizer
3. Lime
4. Soil Testing Recommendation - County Extension Service

B. Manufacturer's Literature

Including physical characteristics, application and installation instructions, and recommendations:

1. Hydraulic Mulch Material
2. Erosion Control Material

1.03 DELIVERY

A. Fertilizer and Lime

Deliver materials to the site in the original, unopened containers bearing the manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. In lieu of containers, furnish fertilizer and lime in bulk with a certificate indicating the above information accompanying each delivery.

B. Seed

Deliver seed to the site in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with USDA Federal Seed Act 53 Stat. Rules and Regulations and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected.

1.04 STORAGE AND HANDLING

Store lime, fertilizer, and seed in dry locations away from contaminants. Protect seed from drying out. When handling materials, do not drop or dump from vehicles.

1.05 MEASUREMENT AND PAYMENT

A. Grassing shall include all labor, equipment, tools, seed, transportation, services, and any associated construction for complete installation. Measurement shall be made horizontally.

B. Payment shall be by the unit price bid per acre in the Bid Form for "Permanent Grassing", only upon delivery of a complete stand of grass.

PART 2 PRODUCTS

2.01 SEED

Permanent seeding shall be in accordance with the following schedule:

SPECIES	RATES/ACRE (lb/acre)	PLANTING DATES
Common Bermuda Grass (Hulled)	8 - 12 lbs	Apr. 15 - Jul 30
Common Bermuda Grass	8 - 10 lbs.	Jan - Apr
German Millet	10 lbs.	Apr 1 - Jul 1
Pensacola Bahiagrass	50 lbs.	Apr 1 - Jul 15

Mulch shall be applied to seeded areas within 24 hours after temporary and permanent seeding operations. Mulch shall be essentially free of noxious weeds and applied at a rate of approximately 70 lbs/1,000 square feet (3,000 lbs/acre).

On areas where ground surface exceeds approximately five (5%) slopes, the mulch shall be tacked using a sufficient amount of asphalt or similar binding material to hold mulch in place.

Seedbed Preparation

1. Work lime and fertilizer into the soil where conventional equipment can be used. Use disk or similar equipment to prepare to depth of 3-4 inches. Use ripper if necessary.

2. Lime and fertilizer may be applied with seed mixture when a hydroseeding used and where mulch will be applied. Seedbed preparation may not be necessary where hydroseeding equipment is used.

3. Slopes that are too steep for conventional equipment (2:1 or steeper) should be seeded with hydroseeding equipment.

Where hydroseeding equipment is not available for use on steep slopes, scarify the soil surface with a chain harrow, pick chain, grader blades with chisels, hand tools, or other equipment that will pit the soil or make trenches approximately 1-2 inches deep, 6-12 inches apart across the slope in which the seed can lodge and germinate.

2.02 LIME

ASTM C 602, commercial agricultural limestone containing a minimum of 94 percent of total carbonates, 52 percent calcium, and 42 percent magnesium. Provide the following ASTM E 11 gradation: minimum 100 percent passing the No. 20 sieve and 75 percent passing the No. 100 sieve. Application rates shall be as recommended by the North Carolina Department of Agriculture through standard soil testing procedures.

2.03 FERTILIZER

Commercial grade, free flowing, uniform in composition and bearing the manufacturer's guaranteed statement of analysis. Analysis of fertilizer and application rates shall be as recommended by the North Carolina Department of Agriculture through soil testing procedures, and in accordance with this schedule:

(Continued on next page)

FERTILIZER REQUIREMENTS				
TYPE OF SPECIES	**YEAR**	**ANALYSIS OR EQUIVALENT N-P-K**	**RATE**	**N TOP DRESSING RATE**
1. Cool season grasses	First	6-12-12	1,500 lbs/ac	50-100 lbs/ac ½/
2. Cool season grasses and legumes	First	6-12-12	1,500 lbs/ac	0-50 lbs/ac 1/
3. Ground covers	First	10-10-10	1,300 lbs/ac 3/	- -
4. Temporary cover crops seeded alone	First	10-10-10	500 lbs/ac	30 lbs/ac 4/
5. Warm season grasses	First	6-12-12	1,500 lbs/ac	50-100 lbs/ac 2/5/

1/ Apply in spring following seeding
2/ Apply in split applications when high rates are used
3/ Apply in three (3) split applications
4/ Apply to grass species only
5/ Apply when plants grow to a height of 2 to 4 inches

2.04 MULCH

Free from noxious weeds, mold, or other deleterious material. Provide wood cellulose fiber when hydroseeding.

A. Straw

Stalks from oats, wheat, rye, barley, or rice. Furnish air-dry condition and of proper consistency for placing with commercial mulch-blowing equipment.

B. Wood Cellulose Fiber

Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9-15 percent moisture, pH range 3.5 to 5.0.

2.05 WATER

Suitable quality for irrigation.

PART 3 EXECUTION

3.01 SEED BED PREPARATION

Areas required to be seeded shall have been brought to the required subgrade. New areas to be seeded shall be thoroughly tilled to a minimum depth of four (4) inches by scarifying, disk harrowing, or other approved methods. Remove debris and stones larger than one inch remaining on the surface after tillage.

A. Fertilizer and Lime

Apply fertilizer and lime at the rates recommended by North Carolina Department of Agriculture.

B. Drill Seeding For New Seeding

Incorporated fertilizer and lime into the soil to a minimum depth of four (4) inches. Application may be performed as part of the tillage operations.

C. Hydroseeding

Apply liquid fertilizer in amounts recommended by North Carolina Department of Agriculture. Apply lime manually.

3.02 SEEDING

A. Seeding Conditions

Immediately before seeding, restore soil to the proper grade. Do not seed when the ground is muddy or in any unsatisfactory condition for seeding.

B. Seeding Method

Apply seed within 24 hours after seedbed preparation. Sow seed with approved sowing equipment using one or a combination of the following methods. Sow one-half the seed in one direction and sow remainder at right angles to the first sowing.

C. Drill Seeding

Use cultipacker seeders or grass seed drills. Drill seed uniformly to maximum depth of ¼" clay soils and ½" in sandy soils. Cover seed by spike-tooth harrow, cultipacker, or other approved devices.

D. Hydroseeding

Mix seed, fertilizer, and wood cellulose fiber in required amount of water to produce a homogenous slurry. After seed, water, and fertilizer have been thoroughly mixed, add 1,500 pounds of wood cellulose fiber per acre (dry weight) and apply the slurry. Seed shall not remain in water containing fertilizer for more than one (1) hour prior to application and shall be agitated during application.

3.03 PROTECTION OF SEEDED AREAS

Immediately after seeding, protect the area against traffic and other use by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.

3.04 RESTORATION

Restore to original condition existing lawn areas which have been damaged during seeding operations. Clean paving when work in adjacent areas is complete.

3.05 LAWN

A. Duration

Lawn establishment period will be in effect until final acceptance.

B. Maintenance

During turf establishment period, mow the seeded area to an average height of two (2") inches whenever the average height of grass becomes four (4") inches. Remove excess clippings, eradicate weeds, apply water and/or fertilizer, overseed, and perform other operations necessary to promote turf growth.

3.06 FINAL ACCEPTANCE

A. Final Inspection and Acceptance

At the end of the turf establishment period, final inspection will be made upon written request at least 10 days prior to the anticipated date. Final acceptance will be based upon a satisfactory stand of turf, defined as 95 percent ground cover of the established species.

B. Replanting

In areas which do not have a satisfactory stand of turf, replant as directed.

--END OF SECTION--

SECTION 11311

SUBMERSIBLE LEACHATE SUMP PUMP

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work under this section shall include the installation of a leachate pumping station. It shall consist of a carriage mounted pump and motor with discharge hose assembly, front exit fittings, control panel, and level sensor, per the operating conditions as shown on specifications and drawings.

B. System shall be designed for primary leachate removal.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section shall be provided by a single supplier who has complete responsibility for the system.

B. The supplier of the leachate removal system will provide all warranty services, which shall be one year from date of installation.

C. All components of the system shall be suitable for the application and the warranty shall include suitability of use.

1.03 SUBMITTALS

Appr. 07

A. The submittal package shall include a complete list of all components provided, pump curves, motor data, layout drawing, control electrical schematic, complete bill of materials, and warranty statement. Manufacturer data sheets shall be provided for each item listed on the bill of control panel material. ✓

B. Submittals shall be for the specified application and "typical" data sheets will not be acceptable. ✓

C. Any deviation from the project specification shall be clearly listed on a submittal package cover sheet. Should any exception be taken the reason for the exception shall be provided. ✓

D. A complete operations and maintenance manual for the system shall be provided. Information shall include installation and removal procedures, system operation explanation, equipment lists, bill of materials, parts information, service contact ✓

information, instructions for each component provided. The manual shall have an index to reference location of each document.

1.04 MEASUREMENT AND PAYMENT

No measurement will be made. Payment will be at the lump sum price bid in the Proposal.

PART 2 - PRODUCTS

2.01 PUMPS

A. The CONTRACTOR shall furnish and install a complete leachate pumping system as manufactured by Sidesloper, GunnCo, Cumming, GA, or approved equal.

B. Pumps shall be centrifugal, submersible design, and suitable to handle primary landfill leachate. The pumps will be coupled to a submersible motor which is non-overloading throughout the operating curve of the pump.

C. The pump shall be capable of the following pumping conditions:

Sump	Capacity	Head	RPM
12A	83 gpm	34'	3450
12B	88 gpm	65'	3450

D. Pump design shall include the following features:

1. Integral check valve of 300 series stainless steel.

2. All series 300 stainless steel construction shall include impellars, bowls, guide vanes, and inlet screen.

3. Each impellar shall have a Teflon seal ring to reduce hydraulic losses.

4. All shaft bearings shall be Teflon or 316 SS.

5. A stainless steel flow inducer shall be provided at the pump inlet.

2.02 MOTOR DESIGN

The motor shall be:

Sump	HP	Voltage	Phase	Hertz
12A	1.5	230	3	60
12B	3.0	230	3	60

A. The motor shall be a squirrel-cage induction motor for submersible operation and conform to NEMA standards and shall be U.L. 778 recognized.

B. Motor shall be of corrosion resistance stainless steel construction.

C. The motor shall not use any oils or greases for lubrication.

D. The motor shall have a Kingsbury type thrust bearing capable of handling the maximum thrust load of the pump operating range.

E. A properly sized jacketed power cable suitable for submerged leachate service shall be provided. Splices of the cable are not allowed.

2.03 CARRIAGE

A. The pump shall be mounted in a 300 series stainless steel carriage for use in a 24" SDR 17 HDPE riser pipe.

B. The carriage shall provide a low center of gravity and all wheel shall remain in contact with the contour of the riser pipe. The wheels shall be of non-corrosive materials with self lubricating qualities and able to travel over welding beads as typically found in riser pipe fabrications. A stainless steel inlet suction screen with round holes shall be provided to prevent debris from entering inlet.

C. The level sensor shall be carriage mounted and capable of removable / replacement without disassembly of the pump assembly.

D. A 0.25" safety / retrieval cable assembly with properly sized cable clips, snap hooks (at each end), and anchor eye bolt of 300 series stainless steel shall be provided.

2.04 DISCHARGE HOSE ASSEMBLY

A. Discharge hose shall be 2" EPDM wire reinforced materials with full vacuum rating and rated at a minimum working discharge pressure of 150 psi.

2.05 DISCHARGE HOSE FITTINGS

A. All hose fittings shall be 300 series stainless steel. Hose fittings shall be suitable for the application. All hose bands shall be hi-torque 300 series stainless steel.

B. The exit connection will penetrate the riser sidewall. A stainless steel tee with a ¼" NPT gauge port with plug and female stainless steel cam and groove disconnect shall be provided. The disconnect fitting shall be positive locking type. A properly sized stainless / liquid filled pressure gauge shall be provided for testing and maintenance use.

C. A mating stainless steel male cam and groove fitting shall be provided for mounting to the force main valve system.

D. A 2" PVC ball type check valve shall be provided. Seats / seals shall be Viton. Each end connection shall be a true union design with F-NPT ends. Fittings shall be stainless steel to connect valve to system.

E. A 2" PVC full port ball type isolation valve shall be provided. Seats / seals shall be Viton. Each end connection shall be a true union design with F-NPT ends. Fittings shall be stainless steel to connect valve to system.

2.06 CONTROL PANEL

A. The control panel shall be GunnCo Series 101 to provide level control, pump operation, and motor protection. The design shall provide pump motor protection, protect operator personnel, and allow check of status without entering the enclosure.

B. Control panel shall consist of a NEMA 4X stainless steel enclosure with lockable outer cover with dead front door and glass viewing window with stainless steel frame.

C. Operator controls shall be mounted on the interior door.

D. Operator accessible components mounted on the front door shall include the following for each pump:

1. H-O-A switch
2. RUN indicating light (green)
3. OVERLOAD indicating light (red)
4. HIGH LEVEL indicator (red)
5. HIGH LEVEL indicating beacon-top mounted (red)
6. Digital read out level indicator
7. Elapsed run time meters (mechanical non-reset type)
8. MAIN breaker with operator handle
9. MOTOR breaker
10. CONTROL circuit breaker
11. RECEPTACLE breaker
12. MOTOR MONITOR device

13. Overload reset button
14. Duplex Receptacle (side mounted)

E. The back plate shall consist of a sheet steel and finished with a primer coat and two coats of baked on enamel. All hardware mounted to the subpanel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified.

F. The panel power distribution shall include all necessary components and shall be completely wired with standard copper conductors. Control wiring shall be properly sized and installed in Panduit type wiring trays.

G. An individual circuit breaker shall be provided for main and control circuit. Motor starter shall be equipped with a motor off switch and be rated to the horse power and amperage of the motor.

H. Individual surge arrestors shall be provided in the control panel for incoming power, pilot circuit (110 volt), and the 4 to 20 mA instrument circuit.

1. The incoming power shall be equipped with a primary side surge arrestor. The units shall be mounted in the control panel and shall be field wired to incoming power. The unit shall provide protection against surge to the pump and panel.

2. A 110 volt surge suppressor shall be provided. The unit shall provide a automatic recovery, failure indication, be internally fused, and capable of a peak clamping voltage of 315V L-N and 350V L-G with less than a 5 nanosecond response time.

3. A 4-20mA signal surge suppressor shall be provided. The unit shall provide a crow bar effect to protect the panel and sensor and shall be capable with the sensor mounted surge suppressor in the sump.

I. A plug in type phase monitor shall be provided. The unit shall be equipped with a status indicating light. The unit shall monitor both high and low voltage and loss of phase and reversal of phase. Phase monitor shall be fused on all legs.

J. A fused type transformer shall be provided. Transformer shall be rated a minimum of .750 kVA.

K. A enclosure space heater with an adjustable thermostat shall be provided.

L. A motor monitor device shall provide NO FLOW protection and automatic cycle time operation for the pump. It shall be fully programmable to for time intervals (2 minutes to 8 hours), trip point settings, re-starts, and low and high voltage. The unit shall have separate time programming capacity for undercurrent conditions which

shall be independent of time restarts for other fault conditions. A diagnostic alphanumeric code shall be displayed for normal and each fault condition. The unit shall provide ground fault protection for the pump. The monitor device will inhibit pump operate only when the HOA switch is in the A position.

M. A corrosion inhibitor shall be provided within the enclosure.

N. A 120 VAC duplex receptacle shall be provided with weather proof backbox and stainless steel cover. The receptacle shall be ground fault interrupter type.

O. The panel will have plug in type 10 amp relays with indicating lights for energizing of motor starter coil, top high level alarm light, and overload lights and remote status contacts.

P. All fuses shall be in enclosed fuse blocks with blown indicating light.

Q. Control Panel Total / Rate Indicator

1. The control panel shall include a total / rate microcontroller-based transmitter / indicator. The device shall provide LCD display simultaneous rate of flow to 6 digits ½" characters height and total gallons pumped to eight digits 5/16" character height. The display shall be manufactured using a cast aluminum body and electronics shall be urethane potted within. The display shall be NEMA 4X rated and mounted in the interior door of the pump control panel and clearly visible without entering the enclosure. The display shall provide a 4-20 mA analog signal and pulse outputs.

2. A panel mounted 24V power supply shall be provided. The power supply shall be fused separately from the control circuit using enclosed type fuse block with blown fuse indication.

3. A paddle wheel sensor shall be provided which is compatible with the indicator as manufactured by the indicator manufacturer. The sensor shall be provided with a minimum of 12' of cable.

4. A PVC Schedule 80 rated flow sensor tee or saddle shall be provided by the pump and control supplier.

2.07 LEVEL CONTROL

A. A panel mounted controller digital readout display shall provide level indication of the side slope sump with 3½ digits to 1/10th of an inch. The pump "ON-OFF-HIGH LEVEL" selection shall be user friendly and accomplished through adjustable set point located on the face of the indicator. Adjustment of the level and alarm set points shall require only the use of a screwdriver without keyboard programming.

The controller unit will accept a 4 to 20 ma signal from the transducer and provide a level indication readout of 0 to 138.6 inches of liquid.

B. Should a HIGH LEVEL condition occur, the display will flash until the condition is corrected.

C. A submersible transducer shall be provided with an adequate sized cable. The transducer shall be all 316 stainless steel and shall be mounted to the pump carriage. The unit shall provide a 4-20 ma signal output to the control unit. Static accuracy rating shall be no less than 1.0%. Cable shall be the same length as the pump power cable.

D. A surge suppressor shall be incorporated as part of the submersible transducer to provide additional protection from lightning transients. The transducer shall be fully warranted against failure due to lightning damage.

E. A permanent bellow type breather device shall be mounted in the control panel or junction box to prevent moisture in the vent tube.

F. A panel mounted intrinsically safe barrier shall be provided for the transducer signal

2.08 BACKBOARD

Mount control enclosure using (2) - 2" x 10' Schedule 40 steel pipe anchored a minimum of 3' below grade with poured concrete anchor and galvanized unit-strut cross members and galvanized mounting hardware. The lower edge of the control panel shall be 32" to 34" above final grade. An earth driven copper ground rod shall be installed with ground wire to the enclosure back-plate.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The station shall be constructed as shown on the drawings.

3.02 The CONTRACTOR shall run the power (underground) from the meter panel (located within 100 feet of sump pump riser) to the control panel for the sump pump.

3.03 START-UP

A. The manufacturer of the system shall provide field supervision / assistance for installation and start-up of the system. The scheduling of this service shall be coordinated with the Contractor to insure the riser is in place and the control panel is connected to power prior to arrival of the factory field technician. Installation and start-up typically requires one day to complete.

B. A start-up report shall be provided to include all component settings and motor operating characteristics data. The report shall certify the system is properly installed or note any deficiencies found to be corrected.

C. At the time of installation, the contractor shall coordinate with the system supplier and owner to provide operator training and troubleshooting in the field.

D. A complete operations and maintenance manual for the system shall be provided. Information shall include installation and removal procedures, system operation explanation, equipment lists, bill of materials, parts information, service contact information, instructions for each component provided. The manual shall have an index to reference location of each document.

--END OF SECTION--

CQA MANUAL
CONSTRUCTION QUALITY ASSURANCE

CONSTRUCTION OF CELL NO. 12
EAST CAROLINA REGIONAL MSW LANDFILL
BERTIE COUNTY, NORTH CAROLINA

FOR

REPUBLIC SERVICES OF NORTH CAROLINA, LLC
dba
EAST CAROLINA ENVIRONMENTAL

SEPTEMBER 2007

NORTH CAROLINA PROFESSIONAL SEAL 16161 ENGINEER WILLIAM F. HODGES 9/13/07

NORTH CAROLINA PROFESSIONAL SEAL No. 17425 ENGINEER HAROLD L. NEWBERRY 9/13/07

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I. GENERAL

A. Construction Quality Assurance (CQA) for the construction of the liner, and leachate collection system and caps shall be provided by an independent consulting engineering firm specializing in the inspection and testing of soils and geosynthetics. Resumes and qualifications including experience with projects of similar type, size, and complexity shall be provided to the Landfill OWNER for their review and approval.

B. The services of the CQA firm shall be provided and paid for by the OWNER. The services of the CQA firm shall be required during construction of the compacted clay liner, HDPE geomembrane liner, geotextile, protective cover - on liner, leachate collection system, compacted soil cap, geomembrane cap, geonet drainage media, and protective soil cover-on landfill cap.

C. The project team providing the CQA services shall consist of the following:

1. DESIGN ENGINEER: Responsible for providing interpretations and clarifications of the Contract Documents, reviewing and approving shop drawings, authorizing minor variations in the work from the requirements of the Contract Documents, and rejecting defective work (duties and responsibilities are described in General Conditions as "ENGINEER"). The DESIGN ENGINEER shall be a registered professional engineer licensed in North Carolina.

2. CQA ENGINEER: Responsible for defining quality assurance, requirements compatible with the project objectives, verifying basic data as reasonable and complete, outlining procedures to process data, development of statistical procedures for the analysis of test data and preparing quality assurance memoranda and quality control reports. The CQA ENGINEER shall report to the DESIGN ENGINEER. The CQA ENGINEER shall be a registered professional engineer licensed in North Carolina. Reference to the CQA ENGINEER, for the purpose of this document, shall include the CQA ENGINEER or his representative.

3. Engineering Technicians: Responsible for field observations, testing and inspection. Technicians will be assigned to the project as deemed necessary by the CQA ENGINEER and will be responsible to the CQA ENGINEER. The CQA ENGINEER, Technician or the CQA ENGINEER's representative shall be on-site during all construction activities, except clearing and grubbing and initial cell excavation. A daily log of all field technicians, testing and inspection shall be maintained by the Technician.

II. COMPACTED CLAY LINER

A. GENERAL

1. The CQA ENGINEER shall certify the materials and installation are in accordance with the plans, specifications, and this CQA Manual.

B. MATERIAL

1. The clay liner material shall consist of on-site cohesive soils, synthetically improved soils, or imported cohesive soils meeting the permeability criteria of $k \leq 1.0 \times 10^{-7}$ cm/sec.

C. STOCKPILING AND MATERIAL APPROVAL

1. All material to be used as the clay liner shall be approved in advance by the CQA ENGINEER. Approval is based upon successful completion of CQA testing outlined herein. Such testing can be performed either during excavation and stockpiling or from existing stockpiles prior to use.

2. The procedure for testing during excavation and stockpiling is outlined below.

   a. Each load of soil will be examined either at the borrow source or the stockpile area. Any unsuitable material will be rejected or routed to separate stockpiles consistent with its end use.

   b. During stockpiling operations, one bulk sample of material placed will be collected. The following tests will be performed prior to placement of any compacted clay liner material:

      1. Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures, ASTM D2216.

      2. Method for Particle - Size Analysis of Soils, ASTM D422.

      3. Test Method for Liquid Limit, and Plasticity Index of Soils, ASTM D4318.

      4. Moisture Density Relationship (ASTM D698).

C. One (1) sample for every 10,000 cubic yards of material stockpiled will be selected for permeability testing (ASTM D 5084-90 Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter).

3. Reports for clay liner will be prepared by the CQA ENGINEER and shall include:

a. Summary of laboratory test data,

b. A summary of construction, sampling and testing method, and recommendations.

D. TEST FILL

1. A test fill will be constructed using the same construction methods, equipment, and material to be used for the clay liner component. The test fill construction will be conducted prior to or coincide with the beginning of construction of clay liner component.

2. Construction equipment and methods shall be reviewed by the CQA ENGINEER prior to test fill placement.

3. Construction methods, sampling, and testing, including permeability testing, shall be specified by the CQA ENGINEER.

E. SUBGRADE

1. The CQA ENGINEER shall verify that the clay liner subgrade is constructed in accordance with the grading specifications.

2. The landfill cell shall be excavated to the lines and grades as indicated on the drawings. The subgrade shall be scarified to a depth of 6" and compacted to 95% as determined by the Standard Proctor Test, ASTM-D698.

3. The subgrade shall be reasonably free of large rocks, roots, stumps and other debris.

F. CONSTRUCTION

1. Clay Liner shall be placed to conform to the $k \leq 1.0 \times 10^{-7}$ cm/sec permeability criteria.

2. Only soil previously approved by the CQA ENGINEER shall be used in construction of the clay liner. Unsuitable material will be removed prior to acceptance by the CQA ENGINEER.

3. All required field density and moisture content tests shall be completed before the overlying lift of soil is placed. The surface preparation (e.g. wetting, drying, scarification, etc.) shall be completed before the CQA ENGINEER will allow placement of subsequent lifts.

4. Moisture content will be monitored by the CQA ENGINEER or his representative prior to compaction. If the soil is drier than the specified minimum moisture content, water will be added and the lift will be mixed to distribute the moisture evenly.

   The surface of each lift shall be scarified prior to placement of subsequent lifts.

5. The thickness of the loose lift shall be measured at random locations after spreading and leveling is completed. Loose lift thickness should not exceed 10" for a final 6" compacted lift thickness.

   Each lift shall be checked visually for rocks, debris, plant materials, and other foreign material. The upper 6" of clay liner shall be reasonably free of material which will not pass through a 1" screen. The remaining 18" of compacted clay liner (below the top 6") shall be free of material which will not pass through a 3" screen. This may require mechanical pulverizing of these soils.

6. The exposed surface of the clay liner shall be rolled with a flat drum roller or equivalent at the end of each work day or when required to protect the compacted clay from adverse weather conditions.

7. The finished clay liner shall be reasonably free of all rock or rock fragments within 6" of the surface. Rock or rock fragments are defined as the material retained by a standard 1" screen. Protrusions shall be removed and all cracks and voids shall be filled and the surface made uniform. Rock or other material protruding more than ½" shall not be allowed. This shall be accomplished by final dressing of the soil liner with smooth drum rollers and hand raking.

8. The surface on which the geomembrane is to be placed shall be maintained in a firm, clean, dry and smooth condition before and during the liner installation.

9. The CQA ENGINEER shall inspect the clay liner and certify that it is in accordance with the specifications and approved plans and receive concurrence of the state prior to the CONTRACTOR beginning installation of geomembrane. This may require separate certifications of liner sections. If this is required, surveys of each section shall be provided by the CONTRACTOR to define the limits of these sections. Placement of geomembrane on any portion of the soil liner surface by the geomembrane installer will constitute his acceptance of the surface.

G. SAMPLING AND TESTING

1. The CQA ENGINEER or his representative will perform field density tests to assure that the soil density and moisture content are within the prescribed limits. The frequency of testing is noted below.

2. Bottom and Sidewall of Cell

   a. Field density tests shall be performed at the rate of one per 10,000 square feet of lined area for each lift of the clay liner base and the subgrade.

   b. The field density tests will be performed using a nuclear density gauge. The location of each test will be randomly determined by the CQA ENGINEER or his representative. All holes shall be repaired as described below.

   c. Perforations in the clay liner resulting from sampling or testing procedures, survey stakes or other activities shall be identified and backfilled by the CQA ENGINEER. The perforations shall be filled with a soil-bentonite mix consisting of 10% minimum by weight bentonite powder or granules mixed with soil liner material. The perforations shall be backfilled with the soil-bentonite mixture in 3-inch loose lifts and thoroughly compacted by hand tamping by the CQA ENGINEER.

   2 * 4 lift = 8 lifts

   d. Two bulk samples of the clay liner for each lift will be collected during placement or compaction. The following tests will be performed:

      1. Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures ASTM D2216.

2. Method for particle-Size Analysis of Soils ASTM D422.

3. Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D4318.

4. Moisture - Density Relationship (ASTM D 698)

e. One sample per acre per each lift of clay liner component will be selected by the CQA ENGINEER for permeability testing (ASTM D5084-90).

f. A one square foot section of clay liner for every 20,000 square feet of liner shall be screened with acceptance of the liner will be based on the following criteria:

Upper 6" Clay Liner

Percentage of Material Passing (by weight)	Screen Size
95% (all tests)	1"
100% (avg. of all tests)	3"

Lower 18" Clay Liner

Percentage of Material Passing (by weight)	Screen Size
100% (avg. of all tests)	3"

Should any sample fail the 99% passing requirement of 1" for the upper 6", then four (4) additional test areas within the 20,000 square foot test area shall be selected by the CQA ENGINEER and tested in like manner. If the four (4) areas pass, then all test areas shall be repaired and the 20,000 square foot area accepted. If any one (1) of the four (4) areas fail, then the 20,000 square foot area shall be reworked and retested. Rocks or roots remaining on or protruding through the surface shall be removed and the surface repaired. These rocks or roots will not be cause for rejection.

g. Results of testing shall be certified to the State within 30 days of clay liner placement.

h. The following procedure shall be used in the event of density or permeability test failure. If density tests do not meet minimum requirements of the specifications, recompaction of the failed area (minimum 100' x 100') shall be performed and retested until the area meets or exceeds requirements outlined in the specifications. If a permeability sample fails to meet the minimum hydraulic conductivity requirements outlined in the specifications, at least five (5) replicate samples shall be obtained in the immediate vicinity of the failed test. Should the replicate samples confirm the failure of the soil to meet specifications, the area of failure shall be localized and reconstructed in accordance with the specifications. This area shall be retested as outlined within the plan.

III. HDPE GEOMEMBRANE LINER

A. GENERAL

The CQA ENGINEER shall certify the materials and installation are in accordance with the plans, specifications, and this CQA Manual.

B. MATERIAL

1. The geomembrane will be 60 mil High Density Polyethylene (HDPE) supplied and installed by firms approved by the OWNER.

2. Seams for providing watertight joints will be extrusion or double hot wedge fusion seams using techniques approved by the CQA ENGINEER.

3. Construction Quality Assurance shall confirm the material meets the minimum physical properties of GRI Test Method GM-13 in Table 1.

TABLE 1

REQUIRED PHYSICAL PROPERTIES OF GEOMEMBRANE LINER (HDPE) SHEET

PROPERTY	TEST METHOD	REQUIRED VALUES 60 MIL	FREQUENCY
Thickness, Mil. (min.)[1]	ASTM D5199 (Smooth)	60 (lowest individual measurement)	Per Roll
	ASTM D5994 (Textured)	60 (lowest individual measurement)	Per Roll
Sheet Density, g/cm^3 (min. ave.)	ASTM D792 or ASTM D1505	0.940	200,000 lbs.[3]
Tensile Properties (min. ave.) (Each Direction)	ASTM D6693 (GRI GM-13)		20,000 lbs.
Strength at Yield (1 lb/in)		126	
Elongational Yield (%)		12	
Strength at Break (1 lb/in)		228(90)[2]	
Elongation at Break (%)		700(100)[2]	
Tear Resistance, 1 lbs. (min. ave.)	ASTM D1004	42	45,000 lbs.[4]
Stress Crack Resistance	ASTM D5397	300 hrs.	per GRI GM 10
Puncture Resistance, lbs. (min.)	ASTM 4833	108 (90)[2]	45,000 lbs.[4]
Carbon Black Content, (Allowable Range in %)	ASTM D1603 or ASTM D4218	2.0 - 3.0	20,000 lbs.[4]
Carbon Black Dispersion, (Acceptable Levels)	ASTM D5596	GRI GM13	45,000 lbs.[4]
Asperity (textured only) (MARV)	GRI Test Method GM12	10	every 2nd roll

1 Thickness - value represents lowest individual value.

2 Value in parenthesis represents minimum value for textured sheet where it differs from smooth sheet value.

3 pounds of resin

4 pounds of geomembrane

C. GEOMEMBRANE MANUFACTURER AND INSTALLER

1. The Geomembrane Installer will submit the following as obtained from the Geomembrane Manufacturer to the CQA ENGINEER:

   a. Production Certification including project references

   b. Testing Program of Compound Ingredients

   c. Material Certification

   d. Test Data for Material and Resin

   e. All of the above submittals will be reviewed and retained by the CQA ENGINEER

2. The Geomembrane Installer will submit the following to the CQA ENGINEER prior to the installation:

   a. Qualifications of Geomembrane Installer Superintendent and Foreman

   b. Resumes of Geomembrane CONTRACTOR field crew

   c. Six (6) sets of geomembrane panel layout drawings

D. GEOMEMBRANE INSTALLATION

1. An initial CQA meeting will be held prior to installation (pre-deployment meeting). The Geomembrane Installer, CQA ENGINEER or his representative, and a representative of the OWNER will be in attendance. The following issues will be discussed and agreed upon by all parties and shall be included in a report in the CQA documentation.

   a. Testing of welds

   b. Characteristics of "good" weld, and

   c. Repair procedures

2. The CQA ENGINEER or his representative will sample rolls from each shipment of geomembrane at the manufacturing plant prior to shipment to the site. The minimum number of rolls to be sampled for each shipment will be

$\sqrt[3]{40} \approx 4$

determined by computing the cube root of the total number of rolls delivered in the shipment and rounding this value upward to the nearest integer with at least one sample per each manufacturer's lot. For instance, if 40 rolls of geomembrane are delivered in a shipment, at least four rolls will be sampled.

3. The random samples must be representative of the material supplied and exclude the outer wrap of geomembrane if signs of scuffing or other damage is observed. Samples should be full roll width and at least 2 feet long.

4. The laboratory testing of the samples selected by the CQA representative shall be directed by the CQA ENGINEER and shall confirm conformance with the following properties:

a.	Thickness	(ASTM D5199 for smooth sheet) (ASTM D5994 for textured sheet)
b.	Density	(ASTM D1505)
c.	Melt Index	(ASTM D1238)
d.	Carbon Black Content	(ASTM D1603)
e.	Tensile Properties	(ASTM D638 or GRI GM-13)
f.	Tear Resistance	(ASTM D1004, DIE C)

5. The CQA ENGINEER or his representative will measure geomembrane thickness of each roll made for the project at the manufacturing plant prior to shipment. Material that does not fall within acceptable thickness criteria will be rejected.

6. The CQA ENGINEER or his representative will mark all areas where grinding is considered to be excessive. The location and repair method for the excessive grinding will be recorded in the daily field reports. The method or repair will be determined by the CQA ENGINEER.

7. Overheating of the geomembrane will be monitored by the CQA ENGINEER or his representative. At the discretion of the CQA ENGINEER, coupons will be cut from the end of the extrusion seams and the bottom side of the seam will be observed for visible warping or deformation. The location and repair method of overheated areas will be recorded in the daily field reports. The method of repair will be determined in the field by the CQA ENGINEER.

8. During seaming, the CQA ENGINEER or his representative will observe the seams for the following:

   a. proper preparation
   b. grinding technique, where applicable, and
   c. overheating

9. The CQA ENGINEER or his representative will observe the geomembrane during the coolest part of the day to check for slack. Any areas where excessive "trampolining" occurs will be marked by the CQA ENGINEER for repair by the Geomembrane Installer.

10. The CQA ENGINEER or his representative will mark all areas where the geomembrane indicates a protrusion from the compacted clay liner. The method of repair will be determined in the field by the CQA ENGINEER.

E. TEST SEAMS

1. The Geomembrane Installer will perform a test seam for each welding machine and crew in use. At a minimum, test seams shall be made upon each start of work for each seaming crew, upon every four (4) hours of continuous seaming, every time seaming equipment is changed or if significant changes in geomembrane temperature or weather conditions are observed. The test seam should be approximately five (5) feet long. The CQA ENGINEER will sample the test seam from the center three (3) feet of the test sample.

   a. The date, time, and equipment, as well as liner temperature, welding temperature, and seaming parameters will be recorded for each test seam.

   5 sample for peel
   5 sample for shear

   b. A minimum of three specimens from each sample will be tested in peel (ASTM D6392) and shear (ASTM D6392). Film Tear Bond type failures will be the criterion for qualification of the test seam. Testing will be performed in the field by the Geomembrane Installer under full-time observation by the CQA ENGINEER or his representative.

   test seams

   done

   Three specimens from each sample shall be tested for Bonded Seam Strength (sheer) using ASTM D6392. The load at failure shall be at least 90 percent of the yield strength (in pounds per inch width) of the parent geomembrane. Yield strain for the seam shall be at least 10 percent and break strain for the seam shall be at least 50 percent.

% yield > 10%
% break > 50%
peel strength ≥ 60% yield strength
break shear strength ≥ 90% yield strength (psi)

Failures in grind areas of extrusion seams shall require resampling and retesting.

At least three specimens from each sample shall be tested for Peel Adhesion using ASTM D6392. The load at failure shall be 60 percent of the yield strength of the parent geomembrane (in pounds per inch width) or greater.

c. Untested portions of the test seam will be retained by the CQA ENGINEER for the project record and future testing as required.

d. All test seams must pass the field testing before production seaming is performed by the Geomembrane Installer.

F. FIELD DESTRUCTIVE TESTING Table 3 air channel pressure Table 3.b PPPG 75/370

1. The Geomembrane Installer will obtain 12" x 60" samples of field seams, suitable for testing, at an average frequency of one sample per 500 linear feet of weld. The date, time and equipment, seam number, and seaming parameters will be marked on each sample and recorded by the CQA ENGINEER. — lab

2. Samples retained will be tested in the field by the Geomembrane Installer. A minimum of five specimens from each sample will be tested in peel and shear (ASTM D6392) for the properties in Table 2.

field

Five specimens from each sample shall be tested for Bonded Seam Strength (shear) using ASTM D6392. The load at failure shall be at least 90 percent of the yield strength (in pounds per inch width) of the parent geomembrane. Yield strain for the seam shall be at least 10 percent and the break strain shall be at least 50 percent. Failures in grind areas of extrusion seams may require resampling and retesting.

At least five specimens from each sample shall be tested for Peel Adhesion using ASTM D6392. The load at failure shall be 60 percent of the yield strength of the parent geomembrane (in pounds per inch width) or greater.

The average values of each set of five specimens must meet the specifications, and four of the five specimen tests must meet the specifications for seam to be considered a passing seam. If the average of the five specimens is adequate, but one of the specimens is failing, values for the failing specimen must be at least 80 percent of the values required for the seam for the sample to pass. A maximum of one non-film tear bond failure

out of five tests is acceptable provided the non-film tear bond specimen meets strength requirements. If unresolved discrepancies exist between the CQA ENGINEER's and CONTRACTOR's test results, the archived sample may be tested by the CQA ENGINEER. Samples which do not pass the shear and peel tests will be resampled from locations at least 10 feet on each side of the original location. These two re-test samples must pass both sear and peel testing. If these two samples do not pass, then additional samples will continue to be obtained until the questionable seam area is defined.

3. The CQA ENGINEER or the OWNER may require additional random samples to be taken for testing in areas which visually appear defective and not in accordance with the project requirements.

   At the end of each double wedge welded field seam of 100' or more in length, a 1" wide coupon is to be cut from near the end of the seam. This coupon is to be tested in peel using a field tensiometer. The CQA ENGINEER will observe this test and FTB type failures will be the criteria for preliminary acceptance of the production seam. (Final seam acceptance is contingent on air and destructive testing).

G. NON-DESTRUCTIVE TESTING

1. The CQA ENGINEER shall confirm that the geomembrane installer has conducted non-destructible testing of the entire length of all field seams in accordance with Section 02750 of the specifications. The testing method shall be approved by the CQA ENGINEER in advance.

2. Non-destructive testing will be observed by the CQA ENGINEER or his representative on a full-time basis.

H. DESTRUCTIVE LABORATORY TESTING

1. Destructive seam samples will be laboratory tested by the CQA ENGINEER. Testing frequency shall average one sample per 500 linear feet of field seam.

   a. Test samples will be at least 12" x 36". A minimum of five peel specimens will be tested for each sample in accordance with ASTM D6392 for the properties listed in Table 2. At least five specimens from each sample will be tested for bonded shear strength (shear) in accordance with ASTM D6392. These test samples shall be taken at the same locations as the CONTRACTOR's destructive testing samples.

b. All laboratory specimens will be conditioned for a minimum of one hour prior to testing at the Standard Atmosphere for Testing Geosynthetics, that is, air maintained at a relative humidity of 65 $\pm$5 percent and a temperature of 21 $\pm$2°C (70 $\pm$4°F).

2. The load and elongation at failure will be measured for each specimen. FTB is the qualifying criterion.

   a. The CQA ENGINEER will describe the type of failure for each specimen and record the presence of any disbonding, delamination, foreign material in the bond area, etc.

   b. As a general guideline, the bonded shear strength (shear) should equal or exceed 90% of the tensile strength (in pounds per unit width) of the parent material. If a shear specimen exhibits a failure within the grinding or preparation area adjacent to the seam that falls below 90 percent of the parent material strength, the CQA ENGINEER may require additional seam repair. The elongation of the specimen at failure should be a minimum of 50 percent when testing in shear.

   c. As a general guideline, the peel adhesion should exceed 60 percent of the sheet yield strength of the parent material. If a peel specimen fails in the grinding or preparation area, this should be clearly noted on the test report. Both sides of the double-wedge fusion seam must pass the testing requirements to constitute a passing test.

   d. The average values of each set of five specimens must meet the specifications, and four of the five specimen tests must meet the specifications for seam to be considered a passing seam. If the average of the five specimens is adequate, but one of the specimens is failing, values for the failing specimen must be at least 80 percent of the values required for the seam for the sample to pass. A maximum of one non-film tear bond failure out of five tests is acceptable provided the non-film tear bond specimen meets strength requirements. If unresolved discrepancies exist between the CQA ENGINEER's and CONTRACTOR's test results, the archived sample may be tested by the CQA ENGINEER. Samples which do not pass the shear and peel tests will be resampled from locations at least 10 feet on each side of the original location. These two re-test samples must pass both sear and peel testing. If these two samples do not pass, then additional samples will continue to be obtained until the questionable seam area is defined.

e. Seams represented by a failing destructive field or laboratory test sample shall be cut out and replaced or covered with a cap strip and the seam bounded by supplemental passing field and laboratory destructive test samples at both ends.

TABLE 2
SEAM STRENGTH AND RELATED PROPERTIES OF THERMALLY BONDED SMOOTH AND TEXTURED HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE
60 MIL SHEET

Property	Units	Value
Hot Wedge Seams (1)		
shear strength (2)	lb/in	120
shear elongation at break (3)	%	50
peel strength (2)	lb/in	91
peel separation	%	25
Extrusion Fillet Seams		
shear strength (2)	lb/in	120
shear elongation at break (3)	%	50
peel strength (2)	lb/in	78
peel separation	%	25

(1) Also for hot air and ultrasonic seaming methods
(2) Value listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
(3) Elongation measurements should be omitted for field testing

IV. GEOTEXTILE

→ for UF floor/slope

A. MATERIAL

1. The geotextile shall be a non-woven geotextile of polypropylene fibers or polyester yarns which is intended to be and shall be suitable for separation and cushioning. The geotextile shall be a 6 ounce per square yard fabric.

2. During shipment and storage, the geotextile shall be protected from ultraviolet light exposure, precipitation, contamination or other damaging conditions. Geotextile rolls shall be shipped and stored in relatively opaque and watertight wrappings. The CQA ENGINEER shall verify that rolls of geotextile have been shipped and are stored in accordance with the specifications.

3. The CQA ENGINEER shall random sample from each shipment of geotextile delivered to the site, sampling a minimum of 10% of each shipment. The 3' x 3' samples shall be retained as part of the project records. Should visual inspection by the CQA ENGINEER reveal any apparent deficiencies in the material, the CQA ENGINEER shall at the OWNER's expense, take a minimum of two samples and have them tested for the properties listed in Section 02757.

B. GEOTEXTILE MANUFACTURER AND INSTALLER

1. The CONTRACTOR shall submit the following as obtained from the Geotextile Manufacturer to the CQA ENGINEER to review:

   a. Production Certification ✓
   b. Material Certification ✓
   c. Test Data for Material ✓

2. The CONTRACTOR shall submit the following to the CQA ENGINEER prior to installation:

   a. Qualifications of installer superintendent, foreman and field crew.
   b. Six sets of field installation drawings.

C. INSTALLATION

1. The CQA ENGINEER will allow installation of the geotextile to proceed after he has provided certification of the geomembrane liner or a section thereof.

2. The CQA ENGINEER shall monitor the installation of the geotextile to verify there is no damage to the geomembrane liner. Should the liner be damaged the CQA ENGINEER shall direct the CONTRACTOR to make the necessary repairs.

3. The CQA ENGINEER or his representative shall be present during all placement operations and shall verify that all work is in accordance with the plans and specifications.

4. At the conclusion of this activity, the CQA ENGINEER shall provide a written certification that the work has been installed according to plans and specifications.

V. LEACHATE COLLECTION SYSTEM

A. General

The CQA ENGINEER shall certify the materials and installation are in accordance with the plans, specifications, and this CQA Manual.

B. MATERIALS

1. Leachate collection piping shall be in accordance with Section 02745 - Leachate Piping.

2. Gravel for encasing leachate pipe and penetration assembly shall be clean washed gravel composed of a hard mineral such as quartz. Gravel size shall be No 57 in accordance with ASTM D448-86. App A 95/95 ✓ one test check ✓

3. The cushion geotextile fabric shall be a non-woven geotextile of polypropylene fibers or polyester yarns which are intended to be and shall be suitable for separation and cushioning. Geotextile shall be 24 ounce per square yard cushioning fabric. ✓

4. The transition media shall be gravel of a clean washed, hard, non-carbonaceous mineral such as quartz. The gravel size shall be ASTM No. 89 and in accordance with ASTM D448-86 or NC DOT size No. 78M. OK

5. The CQA ENGINEER or his representative shall verify that all materials provided are those specified or are equal and are in accordance with the approved plans, specifications and this CQA Manual.

C. INSTALLATION

1. The CQA ENGINEER will allow installation of the leachate collection system to proceed after he has received all of the destructive test results of the FML and has reviewed and approved the FML as built survey.

2. The CQA ENGINEER shall verify there is no damage to the geomembrane during the installation of the leachate collection system. Should damage occur the CQA ENGINEER shall direct the CONTRACTOR to make the required repairs.

3. The CQA ENGINEER or his representative shall be present during all phases of the leachate collection system construction and shall verify that all work is in accordance with the approved plans, specifications and this CQA Manual.

D. QUALITY ASSURANCE

The CQA ENGINEER or his representative shall verify that the following are provided and installed in accordance with the approved plans, specifications and this CQA Manual. This shall include:

1. High Density Polyethylene Pipe

   a. Receipt of CONTRACTOR's submittals on materials

   b. Review of submittals for pipe

      1. compliance with applicable ASTM standard
      2. unit weight
      3. diameter and SDR
      4. physical dimensions
      5. method of jointing with instructions
      6. nominal pipe joint lengths
      7. re-ended bedding and installation details
      8. instructions and tables or information on strength of each pipe type versus bury
      9. conditions of depth and traffic loadings
      10. Certification by manufacturer that material properties meet the values listed in the material properties sheet.

   c. Secure certification that pipe supplied is represented by the quality assurance data.

   d. Reject pipe which does not meet appropriate ASTM Standards.

   e. Results of any samples taken by the CQA ENGINEER for testing.

   f. Witness and verify that jointing and installation is in accordance with manufacturer's recommendations and the specifications.

   g. Leachate conduits external to the collection system are tested and demonstrated to be leakproof.

2. Gravels

   a. Receipt of CONTRACTOR's submittals on gravel. ✓ HPP.H 95/95

b. Review of submittals for conformity to specifications including quarry's certification of gradation. ✓ APP H 95/95

c. Reject material which does not meet specifications.

d. Results of any samples taken by the CQA ENGINEER for testing.

e. Verify that gravel encasement is in accordance with the approved plans, specifications and this CQA Manual.

3. Geotextile

a. Receipt of CONTRACTOR's submittals on geotextile and review for conformity to specifications.

b. Reject material which does not meet specifications.

c. Verify that geotextile is in accordance with the approved plans, specifications and this CQA Manual.

d. Results of any samples taken by the CQA ENGINEER for testing.

VI. PROTECTIVE COVER - ON LINER - NATIVE SANDY SOILS

A. GENERAL

The CQA ENGINEER shall certify the materials and installation are in accordance with the plans, specifications, and this CQA Manual.

B. MATERIAL

1. Soil for protective cover - native soils - on liner shall be classified according to the United Soil Classification System (USCS) (ASTM D2487-83). Liquid limit, plasticity index (PI), and percent passing the No. 200 sieve will be considered for proper classification. Construction Quality Assurance shall confirm the following minimum requirements:

Test	Minimum Frequency	Criteria
Permeability	3,000 c.y.	$k \geq 1x10^{-3}$ cm/sec

2. Soil materials shall be reasonably free of gypsum, ferrous, and/or calcareous concretions and nodules, refuse, roots, or other deleterious substances.

3. Continuous and repeated visual inspection of the materials being used will be performed by the CQA ENGINEER to ensure proper soils are being used. In addition, the CQA ENGINEER shall make frequent inspections of the placement operations and materials, and will consult with the site personnel on suitable materials and locations of such. All material shall be taken from select sources or stockpiles.

4. The protective cover native soils shall be uniform, smooth, and reasonably free of debris, rock, plant materials, and other foreign material larger than ¾ inch in diameter. The material should contain no sharp edges.

C. STOCKPILING AND MATERIAL APPROVAL

1. All material to be used as protective cover gravel and geotextile shall be approved in advance by the CQA ENGINEER. The CQA ENGINEER must verify the gravel meets all the material requirements.

2. Verification can be accomplished at source and during stockpiling or prior to use at existing stockpiles.

3. The CQA ENGINEER shall prepare reports of all testing, analysis, and verification.

D. CONSTRUCTION

1. The CQA ENGINEER shall provide verification of the following:

   a. Approved material was used to construct the cover.

   b. The gravel cover was constructed in accordance with the approved plans, specifications, and this CQA Manual.

   c. The required cover thickness was achieved.

VII. PROTECTIVE COVER - ON LINER – WASHED SAND

A. GENERAL

The CQA ENGINEER shall certify the materials and installation are in accordance with the plans, specifications, and this CQA Manual.

B. MATERIAL

Material for the washed sand (protective cover) shall be a loose granular material resulting from the disintegration of rocks, shall be capable of 98% passage through a ½" screen and shall have no more than 5% by weight passing the No. 200 sieve. The protective cover material shall contain no aggregate rocks, debris, plant material, material with sharp edges, lignite, coal, ash, or carbonaceous material. By-products of industrial processes, with the exception of quarry grinding operations, shall not be accepted. The washed sand (protective cover) material shall have a permeability of k $\geq 1 \times 10^{-2}$ cm/sec.

Construction Quality Assurance shall meet the minimum requirements for the Granular Drainage Blanket as follows:

Test	Minimum Frequency	Criteria
Grain size to No. 200 sieve (ASTM D 422)	1,500 yd^3	≤ ½ inch
Permeability (ASTM D 2434)	3,000 yd^3	$k \geq 1 \times 10^{-2}$ cm/sec

C. STOCKPILING AND MATERIAL APPROVAL

1. All material to be used as protective cover washed sand shall be approved in advance by the CQA ENGINEER. The CQA ENGINEER must verify the sand meets all the material requirements.

2. Verification can be accomplished during excavation and stockpiling or prior to use at existing stockpiles.

3. The CQA ENGINEER shall prepare reports of all testing, analysis, and verification.

D. CONSTRUCTION

1. The CQA ENGINEER shall provide verification of the following:

   a. Approved material was used to construct the cover.

   b. The washed sand cover was constructed in accordance with the approved plans, specifications, and this CQA Manual.

   c. The geomembrane was not damaged during the construction of the cover.

   d. The required cover thickness was achieved.

VIII. CERTIFICATION

A. The CQA ENGINEER will provide certification that the construction of the liner, cap, leachate collection system, and other associated ancillary facilities for the particular landfill area are constructed according to the approved plans, specifications, and this CQA Manual. Said certification shall have the CQA ENGINEER's seal as a professional engineer registered in the State of North Carolina. The report shall be submitted as each cell or section is constructed.

B. A copy of all test reports and field notes outlined in this CQA plan will be submitted to the North Carolina Department of Environmental and Natural Resources Solid Waste Section for their review and approval within 30 days of completion of a cell or section.

C. The project will not be deemed complete and acceptable until the North Carolina Department of Environmental Health and Natural Resources Solid Waste Section has accepted the construction certification and all supplement reports and data as complete. The CONTRACTOR and the CQA ENGINEER should completely familiarize themselves with the Rules and Regulations of the North Carolina Department of Environmental Health and Natural Resources Solid Waste Section concerning liner systems and landfill cover/cap systems.