NEW HANOVER COUNTY SECURE LANDFILL
NORTH CAROLINA

SPECIFICATIONS
AND CONTRACT DOCUMENTS

CELLS 7/8A LANDFILL EXPANSION

COUNTY CONTRACT NO. 18-0117

VOLUME 1 OF 1

BID DATE: November 5, 2017

Prepared for:
BOARD OF COUNTY COMMISSIONERS
NEW HANOVER COUNTY, NORTH CAROLINA

SCS ENGINEERS, PC

North Carolina Corp. License No. C-1837
CONTRACT DOCUMENTS  
AND  
SPECIFICATIONS  
FOR  
NEW HANOVER COUNTY SECURE LANDFILL  
CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A  
NEW HANOVER COUNTY, NORTH CAROLINA  
COUNTY CONTRACT NO. 18-0117  
BID DATE  
November 5, 2017  
Prepared for  
NEW HANOVER COUNTY, NORTH CAROLINA  
Prepared by  
SCS ENGINEERS, PC  
5850 S. Semoran Blvd  
Orlando, Florida 32822  
C. EDWARD HILTON, JR., P.E.  
10/31/17
TABLE OF CONTENTS
NEW HANOVER COUNTY LANDFILL
CONSTRUCTION OF CELL 7 WITH ALTERNATE FOR CELL 8A
COUNTY CONTRACT NO. 18-0117

DIVISION 0 – BIDDING AND CONTRACT DOCUMENTS
00020 Invitation to Bid
00100 Instructions to Bidders
00110 Instructions for Minority Participation
00300 Bid Form
00410 Bid Bond
00480 Non-Collusion Affidavit
00500 Agreement
00610 Performance Bond
00620 Payment Bond
00650 Certificate of Insurance
00700 General Conditions
00800 Supplementary Conditions
00830 Contract Forms

DIVISION 1 - GENERAL REQUIREMENTS
01000 General Requirements
01010 Summary of Project
01025 Measurement and Payment
01027 Applications for Payments
01030 Special Provisions
01041 Project Coordination
01050 Field Engineering and Survey
01065 Permits and Fees
01070 Abbreviations and Symbols
01200 Project Meetings
01310 Construction Schedules
01340 Shop Drawings, Working Drawings, and Samples
01370 Schedule of Values
01410 Testing and Testing Laboratory Services
01510 Temporary Facilities and Controls
01600 Material and Equipment
01650 Start-Up
01700 Contract Closeout
01720 Project Record Documents
01730 Operating and Maintenance Data
01740 Warranties and Bonds
01900 Suggested Construction Sequencing
01910 Contractor Compliance Requirements

DIVISION 2 - SITE WORK
02210 Site Earthwork and Grading
02215 Safety Procedure
TABLE OF CONTENTS

NEW HANOVER COUNTY LANDFILL
CONSTRUCTION OF CELL 7 WITH ALTERNATE FOR CELL 8A
COUNTY CONTRACT NO. 18-0117

02220  Excavating, Backfilling, and Compaction
02221  Demolition
02272  Grout Filled Fabric Revetments
02276  Temporary Erosion and Sedimentation Control
02371  Riprap
02550  Geotextile
02560  Triplanar Geocomposite
02561  Triaxial Geocomposite
02600  Rounded River Rock
02680  Gas Management System
02720  Storm Drainage Systems
02726  Toe and Sub Drains
02730  Leachate Collection System
02776  Geosynthetic Clay Liner
02778  High Density Polyethylene (HDPE) Geomembrane Liner (Secondary)
02779  Conductive High Density Polyethylene (HDPE) Geomembrane Liner (Primary)
02920  Topsoil
02930  Sodding
02932  Seeding and Mulching
02941  Rain Tarp

DIVISION 3 - CONCRETE
03410  Precast Concrete Structures

DIVISION 11 – EQUIPMENT
11300  Pumps

DIVISION 16 – ELECTRICAL
16000  General Conditions
16050  General Electrical Installation
16111  Electrical Raceways
16120  Low Voltage Wire and Cable
16140  Electrical Apparatus and Equipment
16411  Underground Electrical Services
16450  Grounding
DIVISION 0

BIDDING AND CONTRACT DOCUMENTS
INVITATION TO BID

NEW HANOVER COUNTY
INVITATION TO SUBMIT PROPOSAL
CONSTRUCTION OF CELL 7 WITH ALTERNATES for CELL 8A

New Hanover County will receive sealed proposals from qualified contractors for all labor and materials to complete the work in accordance with the "Specifications and Contract Documents" for New Hanover County Secure Landfill CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A for New Hanover County, North Carolina, Contract #18-0117. Bid documents can be obtained at the County’s website (http://www.nhcgov.com/business-nhc/bids).

The partial expansion consists of approximately 10 acres of Cell 7 that will include pre-construction survey, disposal unit site preparation, placement of the liner system, placement of the soil cover systems, associated access road, stormwater management systems, leachate and stormwater pumping systems, collection piping, forcemain, control panels for pumping systems, coordination with the County staff. The add alternate includes adding approximately 5 acres of additional disposal area (Cell 8A). The construction period will be 210 days from the notice to proceed to substantial completion and an additional 30 days to final completion for the base bid. Fill soil for the preparation of the intermediate cover and protective cover for the landfill shall be supplied from on-site borrow sources and topsoil will be supplied from off-site.

Official bid advertisement date is November 5, 2017. A MANDATORY pre-bid conference will be held on November 14, 2017 at 2:00 p.m. in the Environmental Management Administration Building, 3002 Highway 421 North, Wilmington, NC.

Proposals will be received until 2:00 p.m. on December 12, 2017, by New Hanover County, in the Conference room at the New Hanover County Department of Environmental Management Administration Building, 3002 HWY 421 North, Wilmington, North Carolina 28401, at which time the proposals will be publicly opened and read in accordance with the provisions of law. The deadline time shall be established by the timepiece of New Hanover County's representative. No bids will be accepted after that time.

A copy of the Specifications and Contract Documents can be reviewed at the New Hanover County Environmental Management Office, 3002 Highway 421 North, Wilmington, North Carolina 28401, between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday. Please call for appointments.

Bidders must be licensed contractors in the State of North Carolina at the time proposals are submitted. Pursuant to N.C.G.S. S87-15, it will be necessary for contractors to show evidence of such license in the bid document.

No proposal for construction or repair work may be considered or accepted by said board or governing body unless at the time of its filing the same shall be accompanied by a deposit with said board or governing body of cash, or a cashier's check, or a certified check on some bank or trust company insured by the Federal Deposit Insurance Corporation in an amount equal to not less than five percent (5%) of the proposal. In lieu of making the cash deposit as above provided, such bidder may file a bid bond executed by a corporate
Contractor will be required to comply with OSHA and all federal, state and local laws, ordinances, rules and regulations that in any way affect the Work and will be required to review/endorse the County’s Contractor Compliance Requirements in Section 01910. Bidders will be required to submit a Qualification Questionnaire located in Section 00300 as part of their bid to demonstrate qualifications to perform the Work.

The bidder shall make good faith efforts, as defined in the bid specifications, to subcontract 10% of the dollar value of the single prime contract to businesses owned and controlled by minorities. Individuals who are rebuttably presumed to be minorities include women, Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, and Asian-Indian Americans. Bidders are required to submit, along with the bid, information concerning minority business enterprises which will participate in the contract. The information will include: (1) name and address of each minority firm; (2) description of the work to be performed by each minority firm named; and (3) the dollar value of the work to be performed by each firm named. Bidders are required to submit along with the bid, specific documentation demonstrating that they made good faith efforts to meet established goals. A bid which fails to meet these requirements may be considered non-responsive. Contact Lena Butler at L.butler@nhcgov.com concerning questions related to this issue.

All prime bidders on this project must be pre-qualified in accordance with New Hanover County’s Pre-qualification Ordinance, in order to bid. Bids will not be opened unless the bidder is pre-qualified. Pre-qualification applications may be obtained at the County Legal Department, 230 Government Center Drive, Suite 155, Wilmington, N.C. 28403 or by visiting the County’s website at www.nhcgov.com.

This Invitation to Bid is being used to solicit responses from suitably qualified, experienced and licensed contractors to qualify for services related to the construction of a secure landfill closure project in New Hanover County, North Carolina.

New Hanover County reserves the right to reject any and all bids. Questions will only be accepted in writing by Mr. Ed Hilton (ehilton@scsengineers.com) through the end of business November 21, 2017. Response to the questions will be issued on November 28, 2017. For further information, contact Mr. Ed Hilton, P.E., SCS Engineers, PC, at 813.804.6719.
SECTION 00100
INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINITIONS
ARTICLE 2 - COPIES OF BIDDING DOCUMENTS
ARTICLE 3 - QUALIFICATIONS OF BIDDERS
ARTICLE 4 - EXAMINATION OF CONTRACT DOCUMENTS AND SITE
ARTICLE 5 - ADDENDA AND INTERPRETATIONS
ARTICLE 6 - BID SECURITY
ARTICLE 7 - CONTRACT TIME
ARTICLE 8 - LIQUIDATED DAMAGES
ARTICLE 9 - SUBSTITUTE MATERIAL AND EQUIPMENT
ARTICLE 10 - BID FORM
ARTICLE 11 - PREPARATION AND SUBMISSION OF BIDS
ARTICLE 12 - MODIFICATION AND WITHDRAWAL OF BIDS
ARTICLE 13 - OPENING OF BIDS
ARTICLE 14 - AWARD OF CONTRACT
ARTICLE 15 - BONDS AND INSURANCE
ARTICLE 16 - SIGNING OF AGREEMENT
SECTION 00100

INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINITIONS

Terms used in these Instructions to Bidders which are defined in the General Conditions have the meanings assigned to them in the General Conditions. Instructions or references in these documents that refer to the titles of “Stearns, Conrad, & Schmidt Consulting Engineers, Inc.”, “SCS Engineers”, or “SCS Engineers, PC” apply to each individual title as appropriate for the location of the work.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.1 Complete sets of Bidding Documents may be obtained in the manner defined in the Invitation to Bid.

2.2 Complete sets of full size Bidding Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assume 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 above 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.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.1 Bidders must be licensed contractors in the State of North Carolina at the time proposals are submitted.

3.2 The firm or corporation bidding must demonstrate contracting experience in projects that included liner installation components with a total of at least 10 acres installed within the last ten years from the date of advertisement for this project.

3.3 To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit, following receipt of written request by COUNTY, information including, but not limited to, financial data, previous experience, including references and evidence of authority to conduct business in the jurisdiction where the Project is located. This information must be received by COUNTY within ten days of Bidder receiving the written request. Submittals requested pursuant to this paragraph are in addition to those required elsewhere.

3.4 The Bidder must include in the bid submittal documentation from the major material suppliers (liners, geocomposites, textiles, pipe, structures, etc) that the prime or sub
contractor responsible for paying the supplier for the material is not in arrears on payments for purchases of materials on other projects.

ARTICLE 4 - EXAMINATION OF CONTRACT DOCUMENTS AND SITE

4.1 The Bidder, by and through the submission of his Bid, agrees that he shall be held responsible for having theretofore examined the site, the location of all proposed work and for having satisfied himself from his own personal knowledge and experience or professional advice as to the character, and location of the site, the nature of the ground, surface and subsurface, the water elevations, location of buried utilities and any other conditions surrounding and affecting the work, any obstructions, the nature of any existing construction, and all other physical characteristics of the job, in order that he may include in the prices which he bids all costs pertaining to the work and thereby provide for the satisfactory completion thereof, including the removal, relocation or replacement of any objects or obstructions which may be encountered in doing the proposed work.

4.2 Any records of contours, obstructions, and other subsurface investigations shown on the Drawings or included hereinafter, were made solely for design purposes for the work; and the OWNER and ENGINEER do not warrant, guarantee or represent that said data is correct with respect to actual subsurface conditions; therefore, the Bidder, by and through the submission of his Bid, affirms that he has made, or has caused to be made, his own test holes and/or other investigations of such subsurface conditions, and/or that he has otherwise satisfied himself with respect to such conditions; and, should the Bidder be awarded the Contract, he agrees that he will make no claims against the OWNER or ENGINEER if, in carrying out the work, he finds that the actual conditions do not conform to those indicated.

4.3 The Bidder, in preparing his Bid, shall take into consideration that work by other contractors may be in progress at or near the site during the performance of the work to which the Bid relates and that he will be expected, should he be awarded a Contract, to avoid interference with work done by other contractors and daily operations of landfill personnel and to coordinate his work with contractor’s landfill personnel at the site.

4.4 The Bidder shall examine carefully the Drawings and Specifications and other Contract Documents, and inform himself thoroughly regarding any and all conditions and requirements, including the construction schedule, that may in any manner affect the work to be performed under the Contract. Ignorance on the part of the Bidder will in no way relieve him of the obligations and responsibilities assumed under the Contract.

4.5 The Bidder is required to be familiar with, and shall be responsible for, complying with all federal, state, and local laws, ordinances, rules and regulations that in any manner affect the work.
4.6. In the case of unit price items, the quantities of work to be done and materials to be furnished under this Contract, given in the Bid Form, are to be considered as approximate only and are to be used solely for the comparison of Bids received. The OWNER and/or ENGINEER do not expressly or by implication represent that the actual quantities involved will correspond exactly therewith; nor shall the Bidder plead misunderstanding or deception because of such estimate or quantities or of the character, location or other conditions pertaining to the work. Payment to the Contractor will only be made for the actual quantities of work performed or material furnished in accordance with the Drawings and other Contract Documents, and it is understood that the quantities may be increased or diminished as provided in the General Conditions without in any way invalidating any of the unit or lump sum prices bid.

ARTICLE 5 - ADDENDA AND INTERPRETATIONS

5.1 Should a Bidder find discrepancies or ambiguities in, or omissions from, the Drawings or Specifications, or should he be in doubt as to their meaning, he shall at once notify the ENGINEER.

5.2 No oral interpretations will be made to any Bidder as to the meaning of the Contract Documents. Any inquiry or request for interpretation received seven (7) or more days prior to the date fixed for opening of Bids, or by date specific if noted in the bid announcement or at the pre-bid meeting will be given consideration. All such changes or interpretations will be made in writing in the form of an addendum and, if issued, will be mailed or sent by available means to all known prospective Bidders not later than five (5) days prior to the established Bid opening date. Each prospective Bidder shall acknowledge receipt of such addenda in the space provided therefor in the Bid Form. In case any Bidder fails to acknowledge receipt of such addenda or addendum, his Bid will nevertheless be construed as though it had been received and acknowledged and the submission of his Bid will constitute acknowledgment of the receipt of same. All addenda are a part of the Contract Documents and each Bidder will be bound by such addenda, whether or not received by him. It is the responsibility of each prospective Bidder to verify that he has received all addenda issued before Bids are opened.

ARTICLE 6 - BID SECURITY

Each bid must be accompanied by a cashier’s check or Bid Bond in an amount not less than five percent (5%) of the amount of the Bid. The Bid Security of all Bidders, excepting the three (3) lowest responsible Bidders, will be returned within ten (10) days after the formal opening of Bids. The Bid Security of the three (3) lowest responsible Bidders will be returned within ten (10) days after the OWNER and the accepted Bidder have executed the written Contract and the accepted Bidder has filed an acceptable Bond. If thirty (30) days have passed after the date of the formal opening of the Bids and no Contract has been awarded, the Bid Security of any Bidder will be returned on demand, provided that the Bidder has not been notified of the acceptance of his Bid.
ARTICLE 7 - CONTRACT TIME

The time of completion is of the essence of the Contract, and the Bidder awarded the Contract shall proceed with the Work in accordance with the Contract time period specified in the Contract Documents. In the event of failure to complete the Work within the time specified, the COUNTY may assess damages as provided by law or the Contract Documents, unless an appropriate extension of time has been granted by the COUNTY.

ARTICLE 8 - LIQUIDATED DAMAGES

Provisions for liquidated damages, if any, are set forth in the Agreement and Supplementary Conditions or in the contract document.

ARTICLE 9 - SUBSTITUTE MATERIAL AND EQUIPMENT

9.1 When certain items of equipment and/or materials are specified and/or described as the product of a particular manufacturer together with any required additional information such as model, number, size or catalog number, only such specific items may be used in the Base Bid except as hereinafter provided.

9.2 The Contractor must judge for himself that such alternate equipment is of comparable character and quality to the specified equipment. The OWNER or the OWNER’S ENGINEER will not discuss, approve or disapprove any alternate equipment and/or materials before the proposals are opened. The cost of changes in related work, additional drawings which may be required to illustrate or define the alternate equipment and its relation to the other parts or portions of the Work shall be paid by the Contractor. No change will be made in the amount of time in which to complete the Work or in the liquidated damages.

ARTICLE 10 - BID FORM

10.1 The Bid Form is included in the Contract Documents.

10.2 Bid Forms must be completed in ink or by typewriter. The Bid price of each item on the form must be stated in words and numerals; in case of conflict, words will take precedence.

10.3 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer) and the corporate seal must be affixed and attested by another corporate officer. The corporate address and State of incorporation shall be shown below the signature.
10.4 Bids by partnerships must be executed in the partnership name and signed by an authorized partner, whose title must appear under the signature.

10.5 All names and titles must be typed or printed below the signature.

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

10.7 The address in which communications regarding the Bid are to be directed must be shown.

10.8 The Contractor must submit the names of the subcontractors and material suppliers to be used on this project for items listed on the Bid Form.

10.9 Name of Bidder shall be clearly typed, printed or stamped at the top of each page of the Bid Form.

ARTICLE 11 - PREPARATION AND SUBMISSION OF BIDS

11.1 Signature of the Bidder: The Bidder must sign the Bid Form in the space provided for the signature. If the Bidder is an individual, the words “doing business as ____________”, or “Sole OWNER” must appear beneath such signature. In the case of a partnership, the signature of at least one of the partners must follow the firm name and the words “Member of the Firm” should be written beneath such signature. If the Bidder is a corporation, the title of the officer signing the Bid Form on behalf of the corporation must be stated and evidence of his authority to sign the Bid Form must be submitted. The Bidder shall state in the Bid Form the name and address of each person interested therein.

11.2 Basis for Bidding: The price bid for each item shall be on a lump sum or unit price basis according to the form of the Bid Form. The bid prices shall remain unchanged for the duration of the Contract and no claims for cost escalation during the progress of the Work will be considered.

11.3 Price Bid: The total price bid for the Work shall be the sum of the lump sum prices bid and/or unit prices multiplied by the appropriate estimated quantities for the individual items and shall be stated in figures in the appropriate place on the Bid Form. In the event that there is a discrepancy on the Bid Form due to unit price extensions or addition, the corrected extensions and additions shall be used to determine the project bid amount.

11.4 Submission of Bids:

A. Each Bid must be submitted on the Bid Form as furnished, together with a suitable Bid Security, herein described.
B. The above Bid Form and Bid Security must be submitted in a sealed envelope which shall be marked so as to clearly indicate the following:

1. Bid Project: The Enclosed Bid is for performing/providing services for the CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A.

2. Name of Bidder: _______________________________.

3. Bidder’s State of North Carolina Contractor’s License No. ___________.

Any Bid received without the Bid Project information, Name of Bidder, and the Bidder’s State of North Carolina Contractor’s License Number clearly marked on the outside of the envelope enclosing the Bid Form will not be opened and will not be considered for performance of this project.

If forwarded by mail, the above mentioned envelope shall be enclosed in another envelope. The envelopes shall be addressed and delivered, preferably by special delivery or registered mail, to the New Hanover County Department of Environmental Management, 3002 Highway 421 North, Wilmington, North Carolina 28401. If forwarded by other means than mail, it shall be delivered to the same address listed above. Bids will be received until the date and hour stated in the Invitation for Bid.

C. The Bidder must submit with his Bid an accompanying letter in which he shall list the names and addresses of his major subcontractors together with the services they will supply. These subcontractors will be subject to review as to their competency by the OWNER prior to award of Contract and shall be one of the considerations in determining the lowest responsible Bidder as defined hereafter. After award of Contract, no change in subcontractors shall be made unless approved by the OWNER after a request for such a change has been submitted in writing by the Contractor which shall include the reasons for such request.

D. The Bidder shall submit with his Bid Form evidence of his experience and financial status. The evidence shall include a list of projects similar in character, size and value which he has satisfactorily completed and which are now in satisfactory operation and showing the location, the OWNER’s name and address, the money value of the work and a brief description of each project.

ARTICLE 12 - MODIFICATION AND WITHDRAWAL OF BIDS

12.1 Any Bid may be withdrawn prior to the time scheduled in the Invitation to Bid for the opening thereof. A Bid may also be withdrawn thirty (30) days after the date of the
opening of the Bids, provided that the Bidder has not been notified that his Bid has been
accepted.

12.2 Written Bid modification will be accepted from Bidders if addressed to the New Hanover
County office of the Director of Environmental Management, 3002 HWY 421 North,
Wilmington, North Carolina 28401, and received prior to opening of formal Bids.

12.3 Any Bidder may modify his Bid by telegraphic communication at any time prior to the
scheduled closing time for receipt of Bids, provided such telegraphic communication is
received by the OWNER prior to the closing time, and provided further, the OWNER is
satisfied that a written confirmation of the telegraphic modification over the signature of
the Bidder was mailed prior to the closing time. The telegraphic communication should
not reveal the Bid price, but should provide the addition or subtraction or other
modification so that the final prices or terms will not be known by the OWNER until the
sealed Bid is opened. If written confirmation is not received within two days from the
closing time, no consideration will be given to the telegraphic modification.

ARTICLE 13 - OPENING OF BIDS

13.1 Bids will be publicly opened and read aloud in the conference room at the New Hanover
County office of the Director of Environmental Management, 3002 HWY 421 North,
Wilmington, North Carolina 28401, at the appointed time stated in the Invitation to Bid.
The officer whose duty it is to open them will decide when the specified time has arrived
and no bids received thereafter will be considered. No responsibility will be attached to
any officer for the premature opening of a bid not properly addressed and identified.
Bidders or their authorized agents are invited to be present.

13.2 Bids will be received until the designated time and, after being opened in public will be
reviewed in the private offices of the OWNER’s ENGINEER. No responsibility will be
attached to any officer for the premature opening of a Bid not properly addressed and
identified.

13.3 For the purpose of award, after the Bid Forms are opened and read, the correct
summation of the lump sum prices and/or of the products of the estimated quantities
shown in the Bid Form and the unit prices will be considered the Bid. The amounts then
will be compared and the results of such comparison made available to the public. Until
the final award of the Contract, the right will be reserved to reject any and all Bid Forms
and to waive technical errors and irregularities as may be deemed best for the interests of
the OWNER.

13.4 Bids which contain modifications, are incomplete, unbalanced, conditional, obscure or
which contain additions not requested or irregularities of any kind, or which do not
comply in every respect with the Instructions to Bidders, and the Contract Documents,
may be rejected at the option of the OWNER. The OWNER does not bind himself to
accept the minimum bid stated herein, but reserves the right to accept any Bid which in the judgement of the OWNER will best serve the needs and interests of the OWNER, according to law.

13.5 One Proposal: Only one Bid Form from an individual firm, partnership or corporation under the same or under difference names will be considered. If it is believed that a Bidder is interested in more than one Bid for the work involved, all Bid Forms, in which such a Bidder is interested, will be rejected.

13.6 Collusion Among Bidders: If it is believed that collusion exists among the Bidders, the Bid Forms of all participants in such collusion will be rejected, and no participants in such collusion will be considered in future Bids for the same work.

ARTICLE 14 - AWARD OF CONTRACT

14.1 The OWNER reserves the right to reject any or all Bids, or any part of any Bid, to waive any informality in any Bid, or to readvertise for all or part of the work contemplated. The OWNER reserves the right, prior to award of Contract, to delete from the scope of the project any item or any combination of items of the aggregate Bid prices which do not exceed 25 percent of the total Bid price for the project. If Bids are found to be acceptable by the OWNER, written notice will be given to the lowest responsible Bidder, according to law, of the acceptance of his Proposal and of the award of the Contract to him.

14.2 If a Bidder to whom a Contract is awarded forfeits his Bid Security and the award of the Contract is annulled, the OWNER may then award the Contract to the next lowest responsible Bidder or the work may be readvertised or may be constructed by day labor as the OWNER decides.

14.3 The Contract will be awarded to a lowest responsible Bidder according to law complying with the applicable conditions of the Contract Documents. In determining the lowest responsible Bidder, the following elements, in addition to those noted in the Contract Documents, will be considered: Does each Bidder involved (1), maintain a permanent place of business; (2) have adequate plant and equipment to do the work properly and expeditiously; (3) have suitable financial status to meet the obligations incidental to the work; (4) have appropriate successful contractual and technical experience in similar work; and further (5) what proportional amount of the work does each Bidder intend to perform with his own organization as compared with the portion he intends to subcontract; and (6) what are the qualifications of subcontractors whom each Bidder proposes to use? In addition, each Bidder shall produce satisfactory evidence that he and all subcontractors he proposes to use hold valid state, county and local licenses or certificates of competency covering all operations and all areas of political jurisdiction involved in the work of this Contract.
14.4 The ability of any Bidder to obtain a Performance Bond shall not be regarded as the sole test of such Bidder’s competence or responsibility.

14.5 The OWNER also reserves the right to reject the Proposal of a Bidder who has previously failed to perform properly or to complete Contracts of a similar nature on time.

ARTICLE 15 - BONDS AND INSURANCE

15.1 Attorneys-in-Fact who sign Bid Bonds or Contract Bonds, must file with such bonds a certified copy of their Power of Attorney to sign said Bonds.

15.2 Simultaneously with his delivery of the executed Contract to the OWNER, a Bidder to whom a Contract has been awarded must deliver to the OWNER executed Performance and Payment Bonds on the prescribed forms each in an amount of one-hundred percent (100%) of the total amount of the accepted Bid, as security for the faithful performance of his Contract and for the payment of all persons performing labor or furnishing materials in connection therewith. The Performance and Payment Bonds shall have as the surety thereon only such surety company or companies as are authorized to write bonds of such character and amount under the laws of the State of North Carolina and with a resident agent in New Hanover County, North Carolina. The Attorney-in-Fact, or other officer who signs Performance and Payment Bonds for a surety company must file with such bonds a certified copy of his Power-of-Attorney authorizing him to do so.

15.3 The Performance and Payment Bonds shall remain in force for one (1) year from the date of final acceptance of the work as a protection to the OWNER against losses resulting from latent defects in materials or improper performance of work under the Contract, which may appear or be discovered during that period.

15.4 Qualifications of Sureties:

   General: The following requirements shall be met by all surety companies furnishing Bid, Performance, Payment or other type of Bonds:

   A. Qualifications: As to companies being rated acceptable:

   1. The Surety shall be rated as “A” or better as to General Policyholders Rating and Class X or better as to Financial Category by Best’s Key Rating Guide, published by Alfred M. Best Company, Inc., of 75 Fulton Street, New York, New York, 10038.

   2. The Surety shall be listed on the U.S. Department of the Treasury, Fiscal Service, Bureau of Government Financial Operations, Circular 570, (current Revision) entitled, “Companies Holding Certificates of Authority
3. All Surety Companies are subject to approval and may be rejected by the OWNER without cause, in the same manner that Bids may be rejected.

B. Limitations:

1. Bonding Limits or Bonding Capacity refer to the limit or amount of Bond acceptable on any one risk.

2. The Bonding Limit of the Surety shall not exceed ten percent (10%) of the policy holder surplus (capital and surplus) as listed by the aforementioned Best’s Key Rating Guide, on any one risk (penalty or amount of any one Bond).

C. Requirements: The Agent countersigning the Bond shall be resident in the State of North Carolina.

ARTICLE 16 - SIGNING OF AGREEMENT

16.1 Failure to execute a Contract and file acceptable Bonds as provided herein within ten (10) days after a written Notice of Award has been given, shall be just cause for the annulment of the award and the forfeiture of the Bid Security to the OWNER, which forfeiture shall be considered not as a penalty, but in liquidation of damages sustained. Award may then be made to the next lowest responsible Bidder or all Bids may be rejected.

16.2 The Bidder to whom a Contract is awarded will be required to execute in five (5) counterparts the prescribed Contract and Performance and Payment Bonds within ten (10) days from the date of Notice of Acceptance of the Bidder’s Proposal, and deliver the executed Contract to the OWNER.

END OF SECTION
SECTION 00110

New Hanover County
Minority and/or Women Business Enterprise
(M/WBE) Program

Construction Guidelines and Affidavits

These instructions shall be included with each bid solicitation.
Policy Statement
It is the policy of New Hanover County that minority businesses, as defined by North Carolina General Statute 143-128 have maximum opportunity to participate in the performance of contracts and subcontracts funded in whole or in part with public funds. This includes all aspects of the County’s contracting and procurement programs, including but not limited to construction projects, supplies and materials, as well as professional and personal service contracts.

Goals and Good Faith Efforts
Bidders responding to this solicitation shall comply with the M/WBE program by making Good Faith Efforts to achieve the following aspiration goals for participation.

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<tr>
<th>PROJECT</th>
<th>MBE</th>
<th>WBE</th>
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<tr>
<td>CONSTRUCTION OF CELL 7 WITH ALTERNATES for CELL 8A AND/OR CELL 6</td>
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<td>4%</td>
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Bidders shall submit M/WBE information with their bids on the forms provided. This information will be subject to verification by the County prior to contract award. Firms qualifying as “M/WBE” for the County’s goals must be certified by the NC Department of Historically Underutilized Businesses (NCHUB). Firms qualifying as “WBE” must be designated as “women-owned business and firms qualifying as “MBE” must be certified in one of the other categories (i.e.: Black, Hispanic, Asian American, American Indian, Disabled, or Socially and Economically Disadvantaged). Those firms who are certified as both a “WBE” and “MBE” may only satisfy the “MBE” requirement. A complete database of NC HUB certified firms may be found at http://www.doa.nc.gov/hub/default.aspx. The County shall accept only firms certified by NCDOT for federally funded projects.

Please note: A contractor may utilize any firm desired; however, for participation purposes, all M/WBE vendors who wish to do business as a minority or female must be certified by NC HUB.

The Bidder shall make good faith efforts to encourage participation of M/WBEs prior to submission of bids in order to be considered as a responsive bidder. Bidders are cautioned that even though their submittal indicates they will meet the M/WBE goal, they should document their good faith efforts and be prepared to submit this information, if requested.

The M/WBE’s listed by the Contractor on the Identification of Minority/Women Business Participation which are determined by the County to be certified shall perform the work and supply the materials for which they are listed unless the Contractors receive prior authorization from the County to perform the work with other forces or to obtain materials from other sources. If a contractor is proposing to perform all elements of the work with his own forces, he must be prepared to document evidence satisfactory to the owner of similar government contracts where he has self-performed.

The Contractor shall enter into and supply copies of fully executed subcontracts with each M/WBE or supply signed Letter(s) of Intent to the Project Manager after award of contract and prior to Notice to Proceed. Any amendments to subcontracts shall be submitted to the Project Manager prior to execution.
The Bidder shall provide with the bid the following documentation:

- Identification of Minority/Women Business Participation
  (if participation is zero, please mark zero—Blank forms will be considered nonresponsive)

- Affidavit A (if subcontracting)

OR

- Identification of Minority/Women Business Participation
  (if participation is zero, please mark zero—Blank forms will be considered nonresponsive)

- Affidavit B (if self-performing; must attest that bidder does not customarily subcontract
  work on this type of project—includes supplies and materials)

Within 72 hours or 3 business days after notification of being the apparent low bidder who is
subcontracting anything must provide the following information:

- Affidavit C (if aspirational goals are met or are exceeded)

OR

- Affidavit D (if aspirational goals are not met)

After award of contract and prior to issuance of notice to proceed:

- Letter(s) of Intent or Executed Contracts

**With each pay request, the prime contractors will submit the Proof of Payment Certification, listing
payments made to M/WBE subcontractors.

***If a change is needed in M/WBE Participation, submit a Request to Change M/WBE Participation
Form. Good Faith Efforts to substitute with another M/WBE contractor must be demonstrated.

Minimum Compliance Requirements:

All written statements, affidavits, or intentions made by the Bidder shall become a part of the agreement
between the Contractor and the County for performance of contracts. Failure to comply with any of
these statements, affidavits or intentions or with the minority business guidelines shall constitute a
breach of the contract. A finding by the County that any information submitted (either prior to award of
the contract or during the performance of the contract) is inaccurate, false, or incomplete, shall also
constitute a breach of the contract. Any such breach may result in termination of the contract in
accordance with the termination provisions contained in the contract. It shall be solely at the option of
the County whether to terminate the contract for breach or not. In determining whether a contractor has
made Good Faith Efforts, the COUNTY will evaluate all efforts made by the Contractor and will
determine compliance in regard to quantity, intensity, and results of these efforts.
NEW HANOVER COUNTY
Identification of Minority/Women Business Participation

I, ________________, (Name of Bidder)
do hereby certify that on this project, we will use the following minority/women business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

<table>
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<tr>
<th>Firm Name, Address and Phone #</th>
<th>Work type</th>
<th>*M/WBE Category</th>
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*M/WBE categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (S) Disabled (D)

If you will not be utilizing M/WBE contractors, please certify by entering zero “0”

The total value of MBE business contracting will be ($)______________
The total value of WBE business contracting will be ($)______________
NEW HANOVER COUNTY AFFIDAVIT A – Listing of Good Faith Efforts

County of ____________________________  (Name of Bidder)
Affidavit of ____________________________________________________________________________

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

☐ 1 – (10 pts) Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.

☐ 2 –(10 pts) Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.

☐ 3 – (15 pts) Broken down or combined elements of work into economically feasible units to facilitate minority participation.

☐ 4 – (10 pts) Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.

☐ 5 – (10 pts) Attended prebid meetings scheduled by the public owner.

☐ 6 – (20 pts) Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.

☐ 7 – (15 pts) Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.

☐ 8 – (25 pts) Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

☐ 9 – (20 pts) Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

☐ 10 - (20 pts) Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority/Women Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority/women business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: ______________ Name of Authorized Officer: ________________________________
Signature: _______________________________________________________________________
Title: ________________________________________________________________________

State of ______________, County of ____________________________
Subscribed and sworn to before me this ______ day of ___________ 20____
Notary Public ____________________________
My commission expires __________________
Affidavit of __________________________ (Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the __________________________ contract.

(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: __________ Name of Authorized Officer: __________________________

Signature: __________________________

Title: __________________________

State of __________________________, County of __________________________
Subscribed and sworn to before me this __________ day of __________, 20__
Notary Public __________________________
My commission expires __________________________
NEW HANOVER COUNTY  - AFFIDAVIT C -  Portion of the Work to be Performed by M/WBE Firms

County of __________________________

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by M/WBE businesses as defined in GS143-128.2(g) and 128.4(a),(b),(c)
is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within 72 hours after notification of being low bidder.

Affidavit of __________________________________________ I do hereby certify that on the

(Name of Bidder)

__________________________
Amount of Bid: $_____________________

I will expend a minimum of ________ % of the total dollar amount of the contract with MBE firms and a
minimum of ________ % of the total dollar amount of the contract with WBE firms. Minority/women
businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional
services. Such work will be subcontracted to the following firms listed below.

<table>
<thead>
<tr>
<th>Name and Phone Number</th>
<th>*M/WBE Category</th>
<th>Work description</th>
<th>Dollar Value</th>
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*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I),
Female (F) Socially and Economically Disadvantaged (S) Disabled (D)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with M/WBE Firms for work listed in this
schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach
of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to
the commitment herein set forth.

Date:_____________ Name of Authorized Officer:________________________

Signature:__________________________________________________________

Title:______________________________________________________________

State of ______________, County of ________________________________
Subscribed and sworn to before me this _________ day of ______ 20____
Notary Public___________________________________________________________________________
My commission expires___________________
NEW HANOVER COUNTY AFFIDAVIT D – Good Faith Efforts

County of ______________________
(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by minority/women business is not achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of __________________________________________________________________________ I do hereby certify that on the

(Name of Bidder)

_________________________________________________________________________________

(Project Name)

Project ID# ___________________________ Amount of Bid $ __________________

I will expend a minimum of _______% of the total dollar amount of the contract with MBE firms and a minimum of _______% of the total dollar amount of the contract with WBE firms. Minority/women businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

(Attach additional sheets if needed)

<table>
<thead>
<tr>
<th>Name and Phone Number</th>
<th>*M/WBE Category</th>
<th>Work description</th>
<th>Dollar Value</th>
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*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (S) Disabled (D)

Examples of documentation required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.
G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with M/WBE Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:______________ Name of Authorized Officer: __________________________

Signature: __________________________

Title: __________________________

State of _______________________, County of _______________________

______ Subscribed and sworn to before me this ______day of ______

20____

Notary Public _______________________

My commission expires __________
LETTER OF INTENT
M/WBE Subcontractor Performance

Please submit this form or executed subcontracts with M/WBE firms after award of contract and prior to issuance of notice to proceed.

PROJECT: ____________________________________________________________________

(Project Name)

TO: _________________________________________________________________________

(Name of Prime Bidder/Architect)

The undersigned intends to perform work in connection with the above project as a:

_____ Minority Business Enterprise   _____ Women Business Enterprise

The M/WBE status of the undersigned is certified the NC Office of Historically Underutilized Businesses (required). ___ Yes ___ No

The undersigned is prepared to perform the following described work or provide materials or services in connection with the above project at the following dollar amount:

<table>
<thead>
<tr>
<th>Work/Materials/Service Provided</th>
<th>Dollar Amount of Contract</th>
<th>Projected Start Date</th>
<th>Projected End Date</th>
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_______________________________________      _____________________________________

(Date)                                          (Address)                               (Name & Phone No. of M/WBE Firm)

_______________________________________     ____________________________________

(Name & Title of Authorized Representative of M/WBE)          (Signature of Authorized Representative of M/WBE)
REQUEST TO CHANGE M/WBE PARTICIPATION

(Submit changes only if notified as apparent lowest bidder, continuing through project completion)

Project:  ______________________________________________________________________

Bidder or Prime Contractor:  ____________________________________________________

Name & Title of Authorized Representative:  _______________________________________

Address: ________________________________ Phone #:  ___________________________

________________________________________ Email Address: ______________________

Total Contract Amount (including approved change orders or amendments): $__________

Name of subcontractor:  _________________________________________________________

Good or service provided:  _______________________________________________________

Proposed Action:

___ Replace subcontractor
___ Perform work with own forces

For the above actions, you must provide one of the following reasons (Please check applicable reason):

___ The listed MBE/WBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract.

___ The listed MBE/WBE is bankrupt or insolvent.

___ The listed MBE/WBE fails or refuses to perform his/her subcontract or furnish the listed materials.

___ The work performed by the listed subcontractor is unsatisfactory according to industry standards and is not in accordance with the plans and specifications; or the subcontractor is substantially delaying or disrupting the progress of the work.

If replacing subcontractor:

Name of replacement subcontractor:  ______________________________________________
The M/WBE status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required). ___Yes   ___No

Dollar amount of original contract $________________
Dollar amount of amended contract $ _______________

Other Proposed Action:

___Increase total dollar amount of work   ___Add additional subcontractor
___Decrease total dollar amount of work   ___Other

Please describe reason for requested action: _________________________________________
____________________________________________________________________________

*Please attach Letter of Intent or executed contract document

Dollar amount of original contract $________________
Dollar amount of amended contract $ _______________

Interoffice Use Only:
Approval __Y __N
Date___________________
Signature_______________
# Proof of Payment Certification

**M/WBE Contractors, Suppliers, Service Providers**

**Project Name:** ________________________________________________  
**Prime Contractor:** _____________________________________________  
**Current Contract Amount (including change orders):** $_________________

**Requested Payment Amount for this Period:** $_______________________  
Is this the final payment?  ___Yes   ___No

<table>
<thead>
<tr>
<th>Firm Name</th>
<th>M/WBE Category*</th>
<th>Total Amount Paid from this Pay Request</th>
<th>Total Contract Amount (including changes)</th>
<th>Total Amount Remaining</th>
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</tbody>
</table>

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (S) Disabled (D)

Date:_____________________       Certified By:  __________________________________________

__________________________  
Name  
__________________________  
Title  
__________________________  
Signature
New Hanover County Secure Landfill
Cells 7-13 Expansion Project                October 2017

SECTION 00300
BID FORM
Proposal For

NEW HANOVER COUNTY
CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A
BID NUMBER 18-0117

Submitted: ___________, 2017

New Hanover County
Department of Environmental Management
3002 Highway 421 North
Wilmington, North Carolina 28401

Sir or Madam:

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Proposal, as principal or principals, is or are named herein and that no other person than herein mentioned has any interest in the Proposal of the Contract to which the work pertains; that this Proposal is made without connection or arrangement with any other person, company, or parties making a bid or proposal and that the Proposal is in all respects fair and made in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the Work and that from personal knowledge and experience, or that he has made sufficient test holes and/or other subsurface investigations to fully satisfy himself that such site is a correct and suitable one for this Work and he assumes full responsibility therefore; that he has examined the Drawings and Specifications for the Work and from his own experience or from professional advice that the Drawings and Specifications are sufficient for the Work to be done and he has examined the other Contract Documents and all addenda relating thereto, and that he has satisfied himself fully, relative to all matters and conditions with respect to the Work to which this Proposal pertains.

The Bidder proposes and agrees, if this Proposal is accepted, to contract with New Hanover County Board of County Commissioners (Owner) in the form of Contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, transportation, and labor and to perform the Work specified in the Proposal and other Contract Documents.

The Bidder further proposes and agrees to comply in all respects with the time limits for commencement and completion of the work within the days stated below and as stated in the Contract Form.

New Hanover County Secure Landfill
Cells 7-13 Expansion Project

Bid Form
October 2017
The Bidder further agrees that the deductions for liquidated damages, as stated in the Contract Form, constitute fixed, agreed, and liquidated damages to reimburse the Owner for additional costs to the Owner resulting from the work not being completed to substantial completion and/or final completion within the time limit stated in the Contract Form.

The Bidder further agrees to execute a Contract and furnish satisfactory Performance and Payment Bonds, each in the amount of one hundred percent of the Contract price, and the required Certificates of Insurance, within ten consecutive calendar days after written notice being given by the Owner of the award of the Contract, and the undersigned agrees that in case of failure on his part to execute the said Contract and Performance and Payment Bonds within the ten consecutive calendar days after the award of the Contract, the bid guarantee accompanying his bid and the money payable thereon shall be paid to the Owner as liquidation of damages sustained by the Owner; otherwise, the bid guarantee shall be returned to the undersigned after the Contract is signed and the Performance and Payment Bonds are filed.

The undersigned agrees to accept in full compensation therefor the total of the lump sum prices and extended unit prices items named in the following schedule (estimating worksheet). It is understood that the unit prices quoted or established for a particular item are to be used for computing the amount to be paid to the Contractor, based on the quantities actually constructed as determined by the applicable measurement and payment portion of these specifications.

Bidder’s General Contractors License No. _____________________

Bidder’s Utilities License No. _____________________

_____________________________________________________

Name of Bidder and/or Representative

1. BASE BID PROPOSAL:

The undersigned as BIDDER, hereby declares that the only person or persons interested in the Bid as Principal or Principals is, or are, named herein and that no other person that is herein mentioned has any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company or parties to make a bid or proposal; and that it is in all respects fair and in good faith, without collusion or fraud.
Having become completely familiar with the local conditions affecting the cost of Work at the place where Work is to be executed, and having carefully examined the site conditions as they currently exist, and having carefully examined Bidding and Contract Documents prepared by: SCS Engineers and titled CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A together with any Addenda to such Bidding Documents as listed hereinafter, the undersigned hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation and other facilities as necessary, but which may not be separately itemized and to execute all of the Work described by the aforesaid Bidding and Contract Documents for the lump sum consideration of:

Words ____________________________________________

________________________________________________________________________

Dollars $________________________, said amount being hereinafter referred to as the Base Bid or Base Bid Proposal.

2. Each BIDDER shall fill out and complete the Estimating Worksheet in this Section and submit the appropriate number of copies as part of the Bid. The purpose of the Worksheet is to give each BIDDER the approximate magnitude of the Work required and a basis for uniform comparison of Bids. OWNER does not express, imply or guarantee that the actual amount of Work to be accomplished will correspond to the quantities given, if any. The BIDDERs must assume that the quantities, if indicated, are not accurate and therefore, the BIDDERs must satisfy themselves by personal examination of the location of Work; estimate the quantity of the Work based on the Bid Drawings, Specifications, and any Addendum, thereafter; and by such other means as they may choose, as to the actual conditions and requirements of the Work and the accuracy of the estimate of the Engineer. The BIDDER shall not, at any time after the submission of Bid, dispute any such statement or estimate of the Engineer nor assert that there has been any misunderstanding in regard to the nature or amount of the Work to be done.

The BIDDER may modify the quantities given in the Worksheet if required. Quantities, if listed on the Worksheet are for in-place materials and do not account for settlement, waste, overlaps, volume changes or unusable portions of the materials or products installed. Each section contains a miscellaneous item for BIDDERs to add any cost for Work items not identified on the worksheets, but required by the Contract Documents and Plans.

This Contract is a combination of LUMP SUM items and UNIT PRICE items. It includes one Add-Alternate bid section. The base bid is the construction of Cell 7. The Add Alternate includes adding Cell 8A to the construction of Cell 7. The County maintains the right to determine in its best interest whether to award the contract on the Base Bid costs or on the combination of the Base Bid and the Alternate. The Bidder should be aware that the lower bidder on the base bid may not be the project low bidder if the alternate is included in the project.
Any increase or decrease in the quantities listed in the Worksheet and shown on the Drawing, for any item, shall not be regarded as sufficient grounds for an increase or decrease in the price of that item, nor total price of the Contract, nor in the time allowed for the completion of the Work, except as provided in the Contract Documents. The OWNER reserves the right to delete portions of the Work, or add to the Work, as OWNER deems necessary and shall have the right to use the BIDDER's unit prices in these Bid Schedules as a basis of negotiation if a change in the quantity of Work occurs.

TRENCH SAFETY COMPLIANCE

1. The bidder acknowledges the existence of North Carolina trench safety standards and the requirements established therein.

2. The bidder further acknowledges that the standards follow the Federal excavation safety standards set forth at 29 CFR Part 1926, Subpart P.

3. The bidder will comply with all applicable trench safety standards, during all phases of the work, if awarded the contract, and will ensure that all subcontractors also comply with the Act.

4. The bidder will consider the geotechnical information available from the Owner, from its own sources, and all other relevant information in its design of the trench safety system it will employ on the subject project. The bidder acknowledges that the Owner is not obligated to provide such information, that he is not to rely solely on such information if provided, and that he is solely responsible for the selection of the data on which he relies in designing said safety system, as well as for the system itself.

5. The bidder acknowledges that included in the Total Price in the Bid Form are costs for complying with the trench safety standards that are in effect as of the date of award of this agreement. The undersigned further identifies the costs to be $10.00.

6. The amount in Item A.11 herein includes the following Trench Safety Compliance Methods and the units of each safety measure.

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<thead>
<tr>
<th>Trench Safety Compliance Method</th>
<th>Unit (LF, SY)</th>
<th>Estimated Quantity</th>
<th>Unit Cost</th>
<th>Extended Cost</th>
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</tbody>
</table>
7. Acceptance of the bid to which this certification and disclosure applies in no way represents that the Owner or its representatives have evaluated or determined that the above costs are adequate to comply with the applicable trench safety requirements, nor does it in any way relieve the undersigned of his sole responsibility for complying with all applicable safety requirements.
**ESTIMATING WORKSHEET**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>ESTIMATED QUANTITY</th>
<th>UNITS</th>
<th>UNIT PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
</table>

**A. General (Applies to Cell 7 Construction)**

<table>
<thead>
<tr>
<th>#</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>PRICE</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>1</td>
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<td>Demobilization</td>
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<tr>
<td>3</td>
<td>Contractor's Field Office</td>
<td>1</td>
<td>LS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Engineer's Field Office</td>
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<td>LS</td>
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</tr>
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<td>5</td>
<td>Permits</td>
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<td>6</td>
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<td>7</td>
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<td>LS</td>
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<tr>
<td>8</td>
<td>Administration</td>
<td>1</td>
<td>LS</td>
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<td></td>
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<td>9</td>
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<td>13</td>
<td>Miscellaneous</td>
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<td>LS</td>
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Subtotal A: __________

**B. Site Work for Cell 7**

<table>
<thead>
<tr>
<th>#</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Excavation</td>
<td>100</td>
<td>CY</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Fill</td>
<td>100</td>
<td>CY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Subgrade Preparation</td>
<td>63,850</td>
<td>SY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Topsoil/Sod</td>
<td>18,700</td>
<td>SY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Seed/Mulch</td>
<td>5</td>
<td>AC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Perimeter Road</td>
<td>1,530</td>
<td>LF</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Miscellaneous Clearing and Grubbing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Erosion Control/Silt Fence</td>
<td>820</td>
<td>LF</td>
<td></td>
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Subtotal B: __________
### C. Cell 7 Liner System Installation

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GCL</td>
<td>58,850</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 Mil HDPE Primary</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Conductive geomembrane</td>
<td>58,850</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 Mil HDPE Secondary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>geomembrane</td>
<td>58,850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Triaxial Geocomposite</td>
<td>58,850</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Triplanar Geocomposite</td>
<td>64,420</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Drainage Sand Layer (24&quot;)</td>
<td>43,155</td>
<td>CY</td>
<td></td>
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<tr>
<td>7</td>
<td>Rain Tarp</td>
<td>29,420</td>
<td>SY</td>
<td></td>
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</tbody>
</table>

**Subtotal C:**

### D. Cell 7 Leachate Collection System

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12&quot; HDPE Header Piping</td>
<td>540</td>
<td>FT</td>
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<tr>
<td>2</td>
<td>8&quot; HDPE Lateral Piping</td>
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<tr>
<td>3</td>
<td>4&quot; Toe Drain</td>
<td>1,445</td>
<td>FT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8&quot; HDPE Cleanout</td>
<td>8</td>
<td>LS</td>
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<td>5</td>
<td>12&quot; HDPE Cleanout</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>24&quot; HDPE Detection Riser</td>
<td>1</td>
<td>LS</td>
<td></td>
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<tr>
<td>6</td>
<td>Valve and Appurtenances (associated piping, valving)</td>
<td>1</td>
<td>LS</td>
<td></td>
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<tr>
<td>7</td>
<td>8-oz Non-Woven Geotextile</td>
<td>8,880</td>
<td>SY</td>
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<tr>
<td>8</td>
<td>Rounded River Rock</td>
<td>1</td>
<td>LS</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4&quot; HDPE Transducer Piping</td>
<td>2</td>
<td>LS</td>
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</table>

**Subtotal D**

### E. Cell 7 Stormwater/Erosion Control Piping and Structure Systems

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12-inch RCP</td>
<td>43</td>
<td>LF</td>
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<td>2</td>
<td>18-inch RCP</td>
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<td>LF</td>
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<td>3</td>
<td>30-inch RCP</td>
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<td></td>
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<tr>
<td>4</td>
<td>Precast Drop Inlet</td>
<td>3</td>
<td>EA</td>
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**Subtotal E:**
F. Leachate Pumping System

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Electrical Services and Control Panels (Cell 7)</td>
<td>1</td>
<td>LS</td>
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<tr>
<td>Leachate Collection Pump and Spare (Cell 7)</td>
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<td>LS</td>
<td></td>
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<tr>
<td>Leachate Detection Pump and Spare (Cell 7)</td>
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<td></td>
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<tr>
<td>10” x 14” Dual Wall Force Main</td>
<td>2,210</td>
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<tr>
<td>Valves, Meters, and Tie-Ins</td>
<td>1</td>
<td>LS</td>
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<tr>
<td>Training and Testing</td>
<td>1</td>
<td>LS</td>
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</table>

Subtotal F: _______________________

Base Bid Total: _______________________

ADD ALTERNATE CELL 8A

G. Site Work - Alternate for Cell 8A

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation</td>
<td>100</td>
<td>CY</td>
<td></td>
</tr>
<tr>
<td>Fill</td>
<td>100</td>
<td>CY</td>
<td></td>
</tr>
<tr>
<td>Subgrade Preparation</td>
<td>32,710</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>Topsoil/Sod</td>
<td>1,260</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>Berm Road</td>
<td>820</td>
<td>LF</td>
<td></td>
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</table>

Subtotal G: _______________________

H. Liner System Installation - Alternate for Cell 8A

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
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</tr>
</thead>
<tbody>
<tr>
<td>GCL Primary</td>
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<td>SY</td>
<td></td>
</tr>
<tr>
<td>60 Mil HDPE Secondary</td>
<td>57,100</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>Liner</td>
<td>57,100</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>Triaxial Geocomposite</td>
<td>28,550</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>Triplanar Geocomposite</td>
<td>30,930</td>
<td>SY</td>
<td></td>
</tr>
<tr>
<td>Drainage Sand Layer (24”)</td>
<td>20,930</td>
<td>CY</td>
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</table>
### Leachate Collection System - Alternate for Cell 8A

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Unit</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8&quot; HDPE Lateral Piping</td>
<td>1,430</td>
<td>LF</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4&quot; Toe Drain</td>
<td>496</td>
<td>LF</td>
<td></td>
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<tr>
<td>3</td>
<td>8-oz Non-Woven Geotextile</td>
<td>28,890</td>
<td>SY</td>
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</tr>
<tr>
<td>4</td>
<td>Rounded River Rock</td>
<td>1</td>
<td>LS</td>
<td></td>
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</tbody>
</table>

**Subtotal I:**

### Stormwater/Erosion Control Piping and Structure Systems - Alternate for Cell 8A

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
<th>Subtotal</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-inch RCP</td>
<td>425</td>
<td>LF</td>
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<tr>
<td>Precast Drop Inlet</td>
<td>1</td>
<td>EA</td>
<td></td>
</tr>
</tbody>
</table>

**Subtotal J:**

**Total For Alternate Cell 8A:**

**Total For Cell 7 and Alternate 8A:**
Note: The Bid comparisons for selection of CONTRACTOR will be determined by total of bid items A-F or A-J as determined by the County.

Acknowledgement is hereby made of the following Addenda received since issuance of Plans and Specifications:

Addendum No. _______ Dated: _______  Addendum No. _______ Dated: _______
Addendum No. _______ Dated: _______  Addendum No. _______ Dated: _______
Addendum No. _______ Dated: _______  Addendum No. _______ Dated: _______
Addendum No. _______ Dated: _______  Addendum No. _______ Dated: _______

Attached hereto is a cashier's check on the ______________________________ Bank of
______________________________ or Bid Bond for the sum of __________________________
______________________________ Dollars(_________________), made payable to New Hanover County, North Carolina.

________________________________________ L.S.
(Name of Bidder) (Affix Seal)

________________________________________ L.S.
(Signature of Officer)

________________________________________ L.S.
(Title of Officer)

Address: __________________________________________________
City: ______________________________________________________
State: _____________________________________________________

The full names and residences of persons and firms interested in the foregoing bid, as principals, are as follows:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Name of the executive who will give personal attention to the work:
________________________________________________________________________

Attach list of subcontractors as required by Article 11.4.C of Instruction to Bidders.
QUALIFICATIONS QUESTIONNAIRE

The undersigned warrants the truth and accuracy of all statements and answers herein contained. Include additional sheets if necessary.

1. How many years has your organization been in business as a General Contractor?

2. Describe and give the dates and owners of the last two projects that you have completed similar in type, size, and nature as the one proposed?

3. Have you ever failed to complete work awarded to you? If so, where and why?

4. Name three individuals or corporations for which you have performed similar work and to which you refer:

5. Have you personally inspected the site of the proposed Work? Describe any anticipated problems with the site and your proposed solutions?

6. Will you subcontract any part of this Work? If so, describe which portions?

7. Please list the names and addresses of the subcontractors to be used. Additional information may be required in accordance with the Instructions to Bidders, Item 10.8 and Item 3.4.

8. What equipment do you own that is available for the Work?
9. What equipment will you purchase for the Work?

10. What equipment will you rent for the Work?

11. The following is given as a summary of the Financial Statement of the undersigned: (List Assets and Liabilities and use insert sheet if necessary.)

12. State the true and exact, correct, and complete name under which you do business.

BIDDER IS: ________________________________

CORPORATION, SOLE PROPRIETORSHIP, PARTNERSHIP

____________________________________ (SEAL)
(Individual's Signature)

____________________________________ (SEAL)
(Individual's Name)

doing business as: ________________________________

Business Address:

____________________________________

Phone No.: ________________________________

END OF SECTION
STATE OF NORTH CAROLINA  
COUNTY OF NEW HANOVER

KNOW ALL MEN BY THESE PRESENTS, that ________________, as Principal, and ________________, as Surety, a Corporation chartered and existing under the laws of the State of __________, with its principal offices in the City of ________, and authorized to do business in the State of North Carolina are held and firmly bound unto the Owner, ________________, in the penal sum of ________________ Dollars ($ __________) lawful money of the United States, for the payment of which sum will and truly to be made, we bond ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying bid, dated ____________, 2017, for:

NEW HANOVER COUNTY SECURE LANDFILL  
CONSTRUCTION OF CELL 7 WITH ALTERNATE FOR CELL 8A

NOW, THEREFORE,

A. If the principal shall not withdraw said bid within thirty (30) days after date of opening of the same, and shall within ten (10) days after the prescribed forms are presented to him for signature, enter into a written contract with the Owner in accordance with the Bid as accepted, and give Bonds with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract, then the above obligations shall be void and of no effect, otherwise to remain in full force and effect.

B. In the event of the withdrawal of said bid within the period specified, or the failure to enter into such Contract and give such bonds within the time specified, if the Principal shall pay the Owner the difference between the amount specified in said Bid and the amount for which the Owner may procure the required work and supplies, if the latter amount be in excess of the former, then the above obligations shall be void and of no effect, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals, this ____ day of ________, A.D., 2017, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESSES: (If Sole Ownership or Partnership, two (2) Witnesses required).  
(If Corporation, Secretary Only will attest and affix seal).
New Hanover County Secure Landfill
Cells 7-13 Expansion Project

PRINCIPAL:

WITNESSES:

Name of Firm

________________________
(Affix Seal)
Signature of Authorized Officer

________________________
Title

Business Address

City  State

SURETY:

WITNESSES:

________________________
Corporate Surety

________________________
(Affix Seal)
Attorney-in-Fact

________________________
Title

Business Address

City  State

Name of Local Insurance Agency
CERTIFICATES AS TO CORPORATE PRINCIPAL

I, ________________________, certify that I am the Secretary of the Corporation named as Principal in the within bond; that ____________________ who signed the said bond on behalf of the principal, was then __________________ of said corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said corporation by authority of its governing body.

______________________ (Corporate Seal)
Secretary

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

Before me, a Notary Public duly commissioned, qualified and acting, personally appeared ____________________ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the ________________________________ and that he has been authorized by ________________________________ to execute the foregoing bond on behalf of the Contractor named therein in favor of the Owner, New Hanover County, North Carolina.

Subscribed and sworn to before me this ____ day of __________, 2017, A.D.

(Attach Power of Attorney to original Bid Bond)  Notary Public
State of North Carolina-at-Large

My Commission Expires:

END OF SECTION
STATE OF NORTH CAROLINA

COUNTY OF NEW HANOVER

________________________, being first duly swore deposes and says that he (it) is the bidder in the above bid, that the only person or persons interested in this bid are named therein; that no officer, employee or agent of New Hanover County, or of any other bidder, is interested in this bid, and that affiant makes this bid with no past or present collusion with any other person, firm, or corporation.

__________________________________ Affiant

STATE OF __________

COUNTY OF __________

The foregoing instrument was acknowledged before me this ____________ by (Date)

________________________. (Name of Officer or agent, title of officer or agent)

of ________________, a (Name of Corporation acknowledging)

________________________ corporation, on behalf of the corporation. He/she is (State of place of incorporation)

personally known to me or has produced __________________________ (Type of identification)

as identification and did take an oath.

________________________ Notary Public, Commission No.________

________________________ (Name of Notary typed, printed or stamped)

(SEAL ABOVE)

END OF SECTION
THIS CONTRACT made and entered into this____ day of__________, 2018, by and between
NEW HANOVER COUNTY, a political subdivision of the State of North Carolina, hereinafter
referred to as "County", and ____________________________, a Corporation, hereinafter
referred to as "Contractor";

WITNESS:

That the Contractor, for the consideration hereinafter fully set out, hereby agrees with the County
as follows:

1. Performance. Contractor shall furnish all labor, materials and equipment and shall
   perform all work in the manner and form as provided by the following enumerated
   specifications and documents, which are attached hereto and made a part hereof as if
   fully contained herein: Advertisement for Bids, Instructions to Bidders, General
   Conditions, Supplemental General Conditions, Special Conditions, Plans and
   Specifications, Addenda, and Insurance Certificates for Workers’ Compensation,
   Public Liability and Property Damage, for the project more fully described herein and
generally described as:

   NEW HANOVER COUNTY LANDFILL
   CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

   BID NO. 18-0117

2. Time of Performance. Contractor shall commence work within ten (10) calendar days
   after execution of this agreement; provided that, if County specifies a Notice to
   Proceed, Contractor shall commence work on the date indicated in the Notice to
   Proceed.

   2.1 Delay in Authorization to Commence Work. If, through no fault of Contractor
   County's authorization to commence work is delayed later than the ninetieth
   (90th) day after the bid opening date or the thirtieth (30th) day after
   Contractor's delivery of the executed agreement to County, Contractor may
   terminate this agreement.

   2.2 Required Completion Time. Prior to commencing work, Contractor shall give
   County a construction schedule broken down into calendar days for the various
Contractor shall complete all work for the construction of the base bid and other alternates awarded for the Construction of Cell 7 along with Alternate for Cell 8A within the days indicated in paragraph 2.2.1., after the beginning date/Notice-to-Proceed. If the Contractor fails to complete all work within the required and specified time, the County may at its option either terminate this agreement pursuant to the procedures specified in paragraph 17 herein, or assess liquidated damages against Contractor. In the event County exercises its option to assess liquidated damages, Contractor shall pay the County One Thousand Dollars ($1,000) per day for each consecutive-calendar-day past the scheduled construction final completion date for the work effort defined by the project award and the time schedule for the awarded work noted in 2.2.1 that the work or performance, herein contracted for, remains unfinished and incomplete. It is understood and agreed by the parties hereto that time is of the essence of this contract and that the sum of One Thousand Dollars ($1,000) per day represents the actual damages which the County will have sustained by failure of Contractor to complete the work within the specified times and is agreed upon as liquidated damages; that the provisions for damages are a bona fide provision for such and are not a penalty. It is understood and agreed that if the work herein contracted for is not completed and finished as scheduled herein, the County will have sustained damages and, therefore, the provision for liquidated and agreed upon damages has been incorporated in this agreement as a provision beneficial to both parties. The priority for the construction sequence is Cell 7 and Cell 8A, if Alternate Bid is accepted.

### 2.2.1 Completion Time – from Notice to Proceed

<table>
<thead>
<tr>
<th>Item of Work</th>
<th>Substantial Completion</th>
<th>Final Completion</th>
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</thead>
<tbody>
<tr>
<td>Cell 7 Construction</td>
<td>240 days</td>
<td>30 Additional Days</td>
</tr>
<tr>
<td>Cell 7 &amp; 8A Construction</td>
<td>270 days</td>
<td>30 Additional Days</td>
</tr>
</tbody>
</table>

3. **CONTRACT Amendments and Change Orders.** No modification or rescission of this agreement shall be effective unless evidenced by a writing signed by both parties and by the surety to this agreement. County may issue change orders, which are defined as written orders to Contractor, approved by Board of County Commissioners and signed by the County Manager, authorizing an addition, deletion or revision in the work or an adjustment in the contract price or the contract time.

3.1 **Extra Work.** Contractor agrees to perform such reasonable extra work as may be ordered in writing by the County Manager. County agrees to pay Contractor, upon Contractor's presentation of itemized cost statements, for extra work computed as follows: (a) labor used at actual payroll charges therefor; (b) actual payroll charges for Workers' Compensation Insurance,
Social Security and all other payroll charges; (c) an hourly rate for actual operating hours of equipment used; (d) amounts paid by Contractor to vendors, as evidenced by paid invoices, for material purchased and used on extra work orders; (e) cost of bonding, if applicable; and (f) overhead and profit combined based on fifteen percent (15%) of the total of cost items (a) through (e) above.

3.2 Changes of the Contract Time. The time limit for completion of the project is of the essence of this agreement. If Contractor finds it impossible to complete the work on the project within the originally scheduled time, Contractor may submit a written request for a time extension to the County Manager. The writing shall specify the reasons justifying the granting of the request. Contractor's plea that insufficient time was scheduled shall not be a valid reason for a time extension. If the County Manager, finds that work was delayed because of conditions beyond the control and without the fault of both Contractor and his or her subcontractors or suppliers, the County Manager, shall extend the time for completion in such amount as the conditions justify. Under no circumstances shall Contractor be entitled to damages against County on account of delay.

3.3 Notification of Surety. Contractor shall be solely responsible for notifying his or her surety of any changes affecting the general scope of the work or change in the contract price, and the amount of the applicable bonds shall be adjusted accordingly. Contractor shall furnish written documentation of such adjustment to the County.

4. Payment. County agrees to pay Contractor, for the full and faithful performance of this agreement, the not to exceed the total lump sum and/or unit price sum of:

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and Cents ($ ).

4.1 Partial Payments. County shall make partial payments to Contractor in lump sum amounts upon the successful completion by Contractor and acceptance by County of sections of the work, as specified in the agreement specifications and in accordance with the amounts indicated for each bid in Contractor's bid proposal. From the total amount determined to be payable on a partial payment, five percent (5%) of such amount shall be deducted and retained by County until all work has been accepted by County; provided that, if the County Manager, determines that the work is on schedule at the halfway point of the construction schedule, retainage may thereafter be discontinued on future partial payments. County at its option may reinstate retainage at any time.

4.2 Acceptance of Final Payment as Release. The acceptance by Contractor of final payment shall be and shall operate as a release of County from all claims of Contractor against County, except for claims specifically excepted by Contractor in stated written amounts. However, no payment, final or otherwise, shall release Contractor or his or her sureties from any obligations under the agreement documents or the payment and performance bonds.
4.3 **County's Right to Offset and Recoup.** Nothing contained in this Section 4 shall be construed to impair County's rights to deduct from partial or final payments any sums due to County pursuant to Sections 2, 5, 7.1, 11 or any other section of this agreement.

5. **Contractor's Warranties.** Contractor makes the following warranties concerning the materials, equipment and work furnished pursuant to this Contract.

5.1 **Warranty of Title.** Contractor warrants that title to all work, materials and equipment covered by a request for payment, whether incorporated in the project or not, will have passed to County prior to the submission of the request for payment, free and clear of all liens, claims, security interests and encumbrances.

5.2 **Warranty of Materials and Equipment.** Contractor warrants to County that all materials and equipment furnished under this agreement will be new unless otherwise specified, will be of good quality and free from faults and defects, and will conform to the agreement documents. Contractor warrants all such materials and equipment for a period of one (1) year from the date of completion of the work unless the specifications require a different period of warranty.

5.3 **Warranty of Work.** Contractor warrants to County, for a period of one (1) year from the date of completion of the work, that all work performed under this agreement has been performed in a workmanlike manner, so as to meet the standards of workmanlike quality prevailing in North Carolina at the time of construction.

5.4 **Warranty Against Major Structural Defects.** Contractor warrants that all structures constructed under this agreement are free from major structural defects.

5.5 **Correction of Defects.** County shall give Contractor reasonably prompt notice of all observable defects. If Contractor fails to perform corrective work within a reasonable time, County may perform such work and charge Contractor for the costs thereby incurred. Contractor's Performance Bond shall remain in full force and effect through the applicable one (1) year warranty period.

6. **Indemnity.** Contractor shall indemnify and hold New Hanover County, its officers, officials, agents and employees, harmless against any and all claims, demands, causes of action, or other liability, including attorney fees, on account of personal injuries or death or on account of property damages arising out of or relating to the work to be performed by Contractor hereunder, resulting from the negligence of or the willful act or omission of Contractor, his agents, employees and Subcontractors.
7. **Insurance.** Contractor shall maintain insurance from companies licensed to write business in North Carolina and acceptable to New Hanover County, of the kinds and minimum amounts specified below.

8. **Certificates and Notice of Cancellation.** Before commencing work under this contract, Contractor shall furnish County with certificates of all insurance required below. The certificate of insurance should also evidence self-insured retention/deductibles applicable to the insurance required. Certificates shall indicate the type; amount, class of operations covered, effective date and expiration date of all policies, and shall contain the following statement:

   "The insurance covered by this certificate will not be canceled or materially altered, except after thirty (30) days written notice has been received by County".

9. **Commercial General Liability.**

   9.1 Contractor shall maintain Commercial General Liability and if necessary, Commercial Umbrella Liability insurance with a total limit of not less than $5,000,000 each occurrence for bodily injury and property damage. If such CGL insurance contains a general aggregate limit, it shall apply separately to this project/location or the general aggregate shall be twice the required limit.

   9.2 CGL insurance shall be written on Insurance Services Office (ISO) “occurrence” form CG 00 01 covering Commercial General Liability or its equivalent and shall cover the liability arising from premises, operations, independent Contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

   9.3 County, its officers, officials, agents, and employees are to be covered as additional insureds under the CGL by endorsement CG 20 10 and CG 20 36 or an endorsement providing equivalent coverage as respects to liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, leased or used by the Contractor; and under the commercial umbrella, if any. The coverage shall contain no special limitations on the scope of protection afforded to County, its officers, officials, agents, and employees.

   9.4 The status of County as an additional insured under a CGL obtained in compliance with this agreement shall not restrict coverage under such CGL with respect to the escape or release of pollutants at or from a site owned or occupied by or rented to County.

   9.5 There shall be no endorsement or modification of the CGL or Umbrella Liability limiting the scope of coverage for liability arising from pollution, explosion,
collapse, underground property damage, employment-related practices, or damage to the named insured’s work.

9.6 The Contractor’s Commercial General Liability insurance shall be primary as respects County, its officers, officials, agents, and employees. Any other insurance or self-insurance maintained by County, its officers, officials, and employees shall be excess of and not contribute with the Contractor’s insurance.

10. Workers’ Compensation and Employer’s Liability.

10.1 Contractor shall maintain Workers’ Compensation as required by the general statutes of the State of North Carolina and Employer’s Liability Insurance.

10.2 The Employer’s Liability, and if necessary, Commercial Umbrella Liability insurance shall not be less than $1,000,000 each accident for bodily injury by accident, $1,000,000 each employee for bodily injury by disease, and $1,000,000 policy limit.

10.3 The insurer shall agree to waive all rights of subrogation against the County, its officers, officials, and employees for losses arising from work performed by the Contractor for County.


11.1 Contractor shall maintain Business Auto Liability and, if necessary, Commercial Umbrella Liability insurance with a limit of not less than $5,000,000 each accident.

11.2 Such insurance shall cover liability arising out of any auto, including owned, hired, and non-owned autos.

11.3 Business Auto coverage shall be written on ISO form CA 00 01, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in ISO form CA 00 01.

11.4 The Contractor’s Business Auto Liability insurance shall be primary as respects County, its officers, officials, agents, and employees. Any other insurance or self-insurance maintained by County, its officers, officials, and employees shall be excess of and not contribute with the Contractor’s insurance.

12. THIS PARAGRAPH NOT USED

13. Contractors Pollution Liability Insurance.
13.1 Contractor shall maintain Contractors Pollution Liability covering losses caused by pollution incidents that arise from the operations of the contractor described under the scope of services of this contract.

13.2 Contractor’s Pollution Liability shall apply to bodily injury; property damage, including loss of use of damaged property or of property that has not been physically injured; cleanup costs and defense, including costs and expenses incurred in the investigation defense, or settlement of claims. The policy of insurance affording these required coverages shall be written in an amount of at least $3,000,000 per claim, with an annual aggregate of at least $3,000,000.

13.3 Contractors Pollution Liability shall include as an additional insured County, its officers, officials, agents, and employees.

13.4 If Contractors Pollution Liability is written on a claims-made basis, the Contractor warrants that any retroactive date applicable to coverage under the policy precedes the effective date of this contract; and that continuous coverage will be maintained or an extended discovery period will be exercised for a period of one (1) year, beginning from the time that work under the contract is complete.

14. **Bonds Required.** Pursuant to Article 3, Chapter 44A and Article 8, Chapter 143 of the North Carolina General Statutes, Contractor shall furnish performance and payment bonds, as herein described:

a) Contractor shall furnish and deliver to the New Hanover County a Payment Bond and a Performance Bond covering the faithful performance and completion of the work included in this Agreement and payment for all materials and labor furnished or supplied in connection with the work included in this Agreement.

b) Said bonds shall be issued and furnished to New Hanover County prior to, and as a condition precedent to, commencement of the work of this Agreement.

c) Each of the Payment Bond and Performance Bond shall be furnished on behalf of the Contractor, shall name New Hanover County obligee, and shall be in the amount of one hundred percent (100%) of the amount of the guaranteed repair and maintenance costs. Such bond(s) shall be solely for the protection of New Hanover County.

d) The Payment Bond and the Performance Bond shall be issued by a surety of financial standing having a rating from A.M. Best Company equal to or better than A X and must be included on the approved list of sureties issued by the United States Department of Treasury.

e) The bond shall remain in effect at least one (1) year after the date when final payment becomes due.
f) The surety bond must be in the form set forth in NCGS 44A-33, without any variations therefrom.

g) The Contractor shall provide surety bond wherein Surety waives notice of any and all modifications, omissions, additions, changes and advance payments or deferred payments in or about the Contract, and agrees that the obligations undertaken by the Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, and advance payments or deferred payments.

h) The surety bond must set forth no requirement that suit be initiated prior to the time stipulated in applicable North Carolina Statutes of Limitation.

15. Deductibles and Self-Insured Retentions.

15.1 Any deductibles or self-insured retentions must be declared to and approved by County. At the option of County; the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects County, its officers, officials, agents, and employees; or the Contractor shall procure a bond guaranteeing payment of deductibles or self-insured retentions.

15.2 The Contractor shall be solely responsible for the payment of all deductibles to which such policies are subject, whether or not County is an insured under the policy.


16.1 The policies are to contain, or be endorsed to contain, the following provisions:

16.2 Any failure to comply with reporting provisions of the policies listed in this agreement shall not affect coverage provided to County its officers, officials, agents and employees.

16.3 Each insurance policy required by this contract shall be endorsed to state that coverage shall not canceled by either party except after 30 days prior written notice has been given to County, 230 Government Center Drive #125, Wilmington, NC 28403.

16.4 If Contractor’s liability policies do not contain the standard ISO separation of insureds provision, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.

17. Acceptability of Insurers. Insurance is to be placed with insurers licensed to do business in the State of North Carolina with an A.M. Best’s rating of no less than A VII unless County has granted specific approval.

18. Evidence of Insurance.

18.1 The Contractor shall furnish County with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the
insurance requirements prior to commencing the work, and thereafter upon renewal or replacement of each certified coverage until all operations under this contract are deemed complete.

18.2 Evidence of additional insured status shall be noted on the certificate of insurance as per requirements in this agreement.

18.3 With respect to insurance maintained after final payment in compliance with requirements, an additional certificate(s) evidencing such coverage shall be provided to County with final application for payment and thereafter upon renewal or replacement of such insurance until the expiration of the period for which such insurance must be maintained.

19. Sub-Contractors. Contractor shall include all sub-contractors as insureds under its policies or shall furnish separate certificates for each sub-contractor. All coverage for sub-contractors shall be subject to all of the requirements stated herein. Commercial General Liability coverage shall include independent Contractors’ coverage, and the Contractor shall be responsible for assuring that all sub-contractors are properly insured.

20. Conditions

20.1 The insurance required for this contract must be on forms acceptable to County.

20.2 Where circumstances warrant, County may, at its discretion subject to acceptance by the Risk Management and Finance Department accept letters of credit or custodial accounts in lieu of specific insurance requirements.

20.3 The Contractor shall provide that the insurance contributing to satisfaction of insurance requirements in this agreement shall not be canceled, terminated, or modified by the Contractor without prior written approval of County.

20.4 The Contractor shall promptly notify Environmental Management and the Risk Management Office at (910) 798-7497 of any accidents arising in the course of operations under the contract causing bodily injury or property damage.

20.5 County reserves the right to obtain complete, certified copies of all required insurance policies, at any time.

20.6 Failure of County to demand a certificate of insurance or other evidence of full compliance with these insurance requirements or failure of County to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.

20.7 By requiring insurance herein, County does not represent that coverage and limits will necessarily be adequate to protect the Contractor and such coverage and limits shall not be deemed as a limitation of Contractor’s liability under the indemnities granted to County in this contract.
20.8 If Contractor fails to maintain the insurance as set forth herein, County shall have the right, but not the obligation, to purchase said insurance at Contractor’s expense.

20.9 The Contractor or his engineer may apply to County for approval of higher deductibles based on financial capacity and quality of the carrier affording coverage.

20.10 County shall have the right, but not the obligation of prohibiting Contractor or any sub-contractor from entering the project site or withhold payment until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by County.

21. Independent Contractor. It is mutually understood and agreed that Contractor is an independent contractor and not an agent of County, and as such, Contractor, his or her agents and employees shall not be entitled to any County employment benefits, such as, but not limited to, vacation, sick leave, insurance, worker's compensation, or pension or retirement benefits.

22. Subcontractors. Contractor shall be fully responsible for all negligent acts and omissions of his or her Subcontractors and of persons and organizations employed by them to the same extent that Contractor would be responsible for these acts and omissions. Nothing in the contract documents shall create any contractual relationship between County and any subcontractor or other person or organization having a direct contract with Contractor, nor shall it create any obligation on the part of County to pay any money due any such subcontractor or other person or organization, except as may otherwise be required by law.

23. No Waiver of Legal Rights. Upon completion of the contract work, Engineer/County will promptly make final inspection and notify Contractor of final acceptance. However, final acceptance shall not preclude or estop County from correcting any measurement, estimate or certificate made before or after completion of the work, nor shall County be precluded or estopped from recovering over payments from Contractor or his surety, or both. A waiver on the part of County of any breach of any part of the agreement shall not be held to be a waiver of any other or subsequent breach.

24. Default and Termination. If, through no fault of Contractor, the work on the project is stopped for a period of thirty (30) consecutive days or more, Contractor may terminate this agreement, in which event Contractor will be paid for materials and equipment supplied and work performed up to the date of termination. If Contractor fails to prosecute the work with such diligence as will insure its completion within the contract time, or if Contractor breaches any one of the terms or conditions contained in this agreement and fails to cure said breach within fifteen (15) days of County's mailing of Notice of Default, County may terminate this agreement forthwith. Upon termination, County may, without prejudice to an action for damages or any other remedy, take the prosecution of the work out of the hands of Contractor. County may enter into another agreement for the completion of this contract, or use such other methods as may be
required for the completion of the contract. County may deduct all costs of completing the contract from any monies due to which may become due to Contractor.

25. **Assignment.** The parties mutually agree that this contract is not assignable and shall not be assigned by either party without the written consent of the other party and the surety of this contract.

26. **Contractor's Representation.** Contractor makes the following representations to the County.

Contractor has familiarized itself with the nature and extent of the Contract Documents, work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the work.

Contractor has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing facilities at or contiguous to the site and assumes responsibility for the accurate location of said facilities. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said facilities are or will be required by Contractor in order to perform and furnish the work at the contract price, within the contract time and in accordance with the other terms and conditions of the Contract Documents. Contractor has given Engineer written notice of all conflicts, errors or discrepancies that he or she has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Contractor.

27. **Entire Understanding.** This contract constitutes the entire understanding of the parties and contains all of the terms agreed upon with respect to the subject matter hereof. No modification or rescission of this contract shall be effective unless evidenced by a signed writing.

28. **Familiarity with Laws.** The Contractor specifically acknowledges that he has made himself familiar with all Federal, State and local laws, ordinances, rules and regulations, including all Federal and State Occupational Safety and Health Act (OSHA) requirements, which may in any manner affect those engaged or employed in the work of the project, or the materials or equipment in or about such work, or in any way affect the conduct of such work and agrees that he, his employees, Subcontractors and suppliers will, at all times, comply with same. If the Contractor shall discover any provisions in the Contract Documents which are contrary to or inconsistent with any such law ordinance, rule or regulation, he shall immediately give notice thereof to the County in writing, identifying any items of work affected, and he shall not proceed until he has received written direction from the County with respect to these items. If the Contractor performs contrary to or inconsistently with any such law ordinance rule or regulation without giving such notice, he shall bear all costs that are consequences of such performance.
29. **Contract Work Hours and Safety Standards Act.** The Contractor shall fully comply with the Contract Work Hours and Safety Standards Act (40 USC 327-330) as supplemented by Department of Labor Regulations contained in 29 CFR Parts 3, 5 and 5a.

30. **Copeland "Anti-Kickback" Act.** The Contractor shall fully comply with all Federal provisions set forth in this act and 24 CFR 85.36, such that each contractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled. The Contractor shall report all suspected or reported violations to New Hanover County and other appropriate authority.

31. **Section 504 of the Rehabilitation Act of 1973, as amended and Nondiscrimination on the Basis of Handicap.** The Contractor shall fully comply with all Federal provisions set forth, such that no qualified handicapped person shall, on the basis of handicap be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination hereunder.

32. **Age Discrimination Act of 1975, as amended and Nondiscrimination on the Basis of Age.** The Contractor shall fully comply with all Federal provisions set forth such that no qualified person shall on the basis of age be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination hereunder.

33. **Executive Order 11246.** The Contractor shall fully comply with all Federal provisions set forth in this order.

34. **Permits and Licenses.** Contractor shall procure all applicable permits and licenses, including permits and licenses required pursuant to applicable patent and copyright laws, shall pay all charges and fees, and shall give all notices necessary and incidental to the due and lawful prosecution of the work.

35. **Non-Discrimination.** Contractor will take affirmative action not to discriminate against any employee or applicant for employment or otherwise illegally deny any person participation in or the benefits of the project that is the subject of this contract because of age, race, creed, color, sex, disability or national origin. To the extent applicable, Vendor will comply with all provisions of Executive Order No. 11246, the Civil Rights Acts of 1964 (P.L. 88-352) and 1968 (P.L. 90-284), and all applicable Federal, State and local laws, ordinances, rules, regulations, orders, instructions, designations and other directives promulgated to prohibit discriminations. Violation of this provision, after notice, shall be a material breach of this agreement and may result, at County's option, in a termination or suspension of this agreement in whole or in part.

36. **Taxes.** Contractor shall pay all applicable Federal, State and local taxes, including sales taxes on all equipment and materials used in the project. County is qualified to receive all sales taxes paid on the project as a rebate. Contractor shall submit a statement showing the invoice, sales taxes paid to State, sales taxes paid to county of vendor's location, and name of county of all material and equipment used in the project. A tax statement shall be submitted with each pay request and shall be accompanied by an affidavit verifying validation.
37. **Interpretation.** All of the terms and conditions contained in the agreement shall be interpreted in accordance with the laws of the state of North Carolina. The agreement documents shall be given precedence in the following order: Agreement, Modifications, Addenda, Supplementary Conditions, Special Conditions, Instructions to Bidders, General Conditions, Specifications and Drawings.

38. **Deletions of General Conditions.** The following General Conditions are hereby deleted: N/A.

39. **Arbitration.** Arbitration of claims, disputes, and questions arising under this agreement may only be used when both parties agree to arbitrate. Arbitration shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining. In no event shall fewer than three (3) arbitrators be used; County and Contractor shall each select one (1) arbitrator and the two (2) arbitrators shall select a third. The award rendered by the arbitrators shall be final, specifically enforceable and recordable as a judgment in any court having jurisdiction thereof.

40. **Notices.** All notices required hereunder to be sent to either party shall be sent to the following designated address, or to such other address or addresses as may hereafter be designated by either party by mailing of written notice of such change of address, by Certified Mail, Return Receipt Requested:

To County:

New Hanover County Environmental Management  
Attn: Joe Suleyman, Director  
3002 U.S. Highway 421 North  
Wilmington, NC  28401

To Contractor:

41. **Additional Provisions.** **E-Verify Compliance.** Pursuant to S.L. 2017-294, Contractor shall fully comply with the U.S. Department of Homeland Security employee legal status E-Verify requirements for itself and all its subcontractors. Violation of the provision, unless timely cured, shall constitute a breach of Contract.

**Iran Divestment Act of 2016 Compliance Pursuant to N.C.G.S. 147-86.55 et. seq.** The Act requires that the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any contractor or subcontractor found on the State Treasurer’s Final Divestment List. Contractor certifies that it or its subcontractors are not listed on the Final Divestment List created by the North Carolina State Treasurer pursuant to N.C.G.S. 147-85.60. The State Treasurer’s Final Divestment List can be found on the State Treasurer’s website at the address
www.nctreasurer.com/Iran and will be updated every 180 days. By endorsement of this agreement Contractor confirms compliance.

No provision of this Contract shall be amended nor deleted, however, additional provisions may be added to the Contract.

42. Contract Documents. The Contract Documents, as stated in the Instructions to Bidders and attached hereto, are as fully a part of this Contract as if herein repeated. An enumeration of the Drawings accompanying these Contract Documents follows:

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<td>STORMWATER MANAGEMENT PLAN</td>
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IN WITNESS WHEREOF, the parties have caused the execution of this instrument, by authority duly given and on the day and year first above written.

NEW HANOVER COUNTY

[SEAL]

New Hanover County Secure Landfill   Agreement
Cells 7-13 Expansion Project 00500 - 14
June 2017
NEW HANOVER COUNTY

I, ______________________, a Notary Public of the State and County aforesaid, certify that ___________________ personally came before me this day and acknowledged that (s)he is Clerk to the Board of County Commissioners of New Hanover County, and that by authority duly given and as the act of the Board, the foregoing instrument was signed in its name by its Chairman, ______________________, sealed with its official seal and attested by herself as its Clerk.

WITNESS my hand and official seal, this _______ day of __________________, 2018.

Notary Public

My commission expires:

STATE OF

COUNTY OF
I, __________________________, a Notary Public of the State and County aforesaid, certify that ______________________ personally came before me this day and acknowledged that (s)he is Secretary of ______________________, a ______________________ corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its Vice President, ________________, sealed with its official seal and attested by herself as its Secretary.

WITNESS my hand and official seal, this ________ day of ______________, 2018.

Notary Public

My commission expires: ______________
SECTION 00610
PERFORMANCE BOND

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

KNOW ALL MEN BY THESE PRESENTS that __________________________ as Contractor, hereinafter called Principal, and ______________________________________ as Surety, hereinafter called Surety, are held and firmly bound unto New Hanover County, as Obligee, hereinafter called Owner, in the amount of ___ Dollars ($__________) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____________, 2018, entered into a Contract with Owner for:

NEW HANOVER COUNTY LANDFILL
CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

In accordance with Drawings and Specifications prepared by SCS Engineers, which Contract is by reference made a part hereof and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that, if the Principal shall in all respects promptly and faithfully perform and comply with the terms and conditions of said Contract and his obligations thereunder and shall indemnify the Owner and the Consulting Engineer and save either or all of them harmless against and from all costs, expenses and damages arising from the performance of said Contract or the repair of any work thereunder, then this obligation shall be void; otherwise, this Bond shall remain in full force and effect, in accordance with the following terms and conditions:

1. The Principal and Surety jointly and severally agree to pay the Owner any difference between the sum to which the said Principal would be entitled on the completion of the Contract, and that sum which the Owner may be obliged to pay for the completion of said work by Contract or otherwise, and any damages, direct or indirect or consequential, which the said Owner may sustain on account of such work, or on account of the failure of said Contractor to properly and in all things, keep and execute all of the provisions of said Contract.
2. And this Bond shall remain in full force and effect for a period of one (1) year from the date of acceptance of the project by the Owner and shall provide that the Contractor guarantees to repair or replace for said period of one (1) year all work performed and materials and equipment furnished that were not performed or furnished according to the terms of the Contract, and shall make good, defects thereof which have become apparent before the expiration of said period of one (1) year. If any part of the project, in the judgment of the Owner, for the reasons above stated needs to be replaced, repaired or made good during that time, the Owner shall so notify the Contractor in writing. If the Contractor refuses or neglects to do such work within five (5) days from the date of service of such Notice, the Owner shall have the work done by others and the cost thereof shall be paid by the Contractor or his Surety.

3. And the said 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 to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligations on this bond, and it does hereby waive Notice of any change, extension of time, alteration or addition to the terms of the Contract or to the work or to the Specifications.

4. The surety represents and warrants to the Owner that they have a Best's Key Rating Guide General Policyholder's Rating of "_______" and Financial Category of "Class ______".

IN WITNESS WHEREOF, the above bounded parties executed this instrument under their several seals, this ____ day of _______________ 2018, A.D., the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).

(If Corporation, Secretary only will attest and affix seal).

PRINCIPAL:

_________________________
(Affix Seal)
Signature of Authorized Officer

WITNESSES:

__________________________
Title

__________________________
Business Address
SURETY:

______________________________

Corporate Surety

______________________________

Business Address

______________________________

City  State

Name of Local Insurance Agency
CERTIFICATES AS TO CORPORATE PRINCIPAL

I, ___________________________, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____________________ who signed the said bond on behalf of the Principal, was then __________________ of said Corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

_____________________________ Corporate Seal
Secretary

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared ___________________________ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the ___________________________ and that he has been authorized by ___________________________ to execute the foregoing bond on behalf of the Contractor named therein in favor of New Hanover County, North Carolina.

Subscribed and sworn to before me this _______ day of ________________, 2018, A.D.

(Attach Power of Attorney)

_____________________________
Notary Public
State of North Carolina-at-Large

My Commission Expires:_________________

END OF SECTION
STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

KNOW ALL MEN BY THESE PRESENTS that _________________________ as Contractor, hereinafter called Principal, and __________________________________________ as Surety, hereinafter called Surety, are held and firmly bound unto New Hanover County, North Carolina, as Obligee, hereinafter called Owner, in the amount of ________________________ Dollars ($__________) for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated ________________, 2018, entered into a Contract with Owner for:

NEW HANOVER COUNTY SECURE LANDFILL
CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

In accordance with Drawings and Specifications prepared by SCS Engineers, which Contract is by reference made a part hereof and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that, if the Principal shall promptly make payments to all claimants, as herein below defined, then this obligation shall be void; otherwise, this Bond shall remain in full force and effect, subject to the following terms and conditions:

A. A claimant is defined as any person supplying the Principal with labor, material and supplies, used directly or indirectly by the said Principal or any subcontractor in the prosecution of the work provided for in said Contract, and is further defined in The North Carolina Statutes.

B. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after performance of the labor or after complete delivery of materials and supplies by such Claimant, may sue on this Bond for the use of such Claimant, prosecute the suit to final judgment for such sum or sums as may be justly due Claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

C. No suit or action shall be commenced hereunder by any Claimant:
1. Unless Claimant, other than one having a direct Contract with the Principal, shall within forty-five (45) days after beginning to furnish labor, materials or supplies for the prosecution of the work, furnish the Principal with a notice that he intends to look to this Bond for protection.

2. Unless Claimant, other than one having a direct contract with the Principal, shall within ninety (90) days after such Claimant's performance of the labor or complete delivery of materials and supplies, deliver to the Principal written notice of the performance of such labor or delivery of such material and supplies and the nonpayment therefor.

3. After the expiration of one (1) year from the performance of the labor or completion of delivery of the materials and supplies; it being understood, however, that if any limitation embodied in this Bond is prohibited by any law controlling the construction hereof such limitations shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

4. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the project, or any part thereof, is situated, or in the United States District Court for the district in which the project, or any part thereof, is situated, and not elsewhere.

D. The Principal and the Surety jointly and severally, shall repay the Owner any sum which the Owner may be compelled to pay because of any lien for labor or materials furnished for any work included in or provided by said Contract and shall pay Owner all losses, damages, expenses, costs and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under the contract.

E. The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration of or addition to the terms of the Contract or to the Work to be performed thereunder or the Specifications applicable thereto shall in any wise affect its obligations on this Bond, and the Surety hereby waives notice of any such change, extension of time, alterations of or addition to the terms of the Contract, or to the Work or to the Specifications.

F. The Surety represents and warrants to the Owner that they have a Best's Key Rating Guide General Policyholder's rating of "____________" and Financial Category of "Class ____________".
IN WITNESS WHEREOF, the above bounded parties executed this instrument under their several seals, this ____ day of _______________ 2018, A.D., the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESS: (If Sole Ownership or Partnership, two (2) Witnesses required).

(If Corporation, Secretary only will attest and affix seal).

PRINCIPAL:

________________________
(Affix Seal)
Signature of Authorized Officer

WITNESSES:

________________________
Title

________________________
Business Address

City             State

SURETY:

________________________
Corporate Surety

________________________
(Affix Seal)
Attorney-in-Fact

________________________
Business Address

City              State

________________________
Name of Local Insurance Agency

CERTIFICATES AS TO CORPORATE PRINCIPAL
I, ___________________________, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____________________ who signed the said Bond on behalf of the Principal, was then _______________ of said Corporation; that I know his signature, and his signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

__________________________
Secretary

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared ______________________ to me well known, who being by me first duly sworn upon oath, says that he is the Attorney-in-Fact, for the ________________ and that he has been authorized by ________________________ to execute the foregoing Bond on behalf of the Contractor named therein in favor of New Hanover County, North Carolina.

Subscribed and sworn to before me this ____ day of ________________, 2018, A.D.

(Attach Power of Attorney)

____________________________________
Notary Public
State of North Carolina-at-Large

My Commission Expires: ___________________
CERTIFICATE OF INSURANCE

THIS IS TO CERTIFY THAT THE _____________________________ Insurance Company

of ______________________ has issued policies of insurance, as described below and identified by a policy number, to the insured named below; and to certify that such policies are in full force and effect at this time. It is agreed that none of these policies will be cancelled or changed so as to affect the interest(s) of (hereinafter sometimes called the Owner) until thirty (30) days after written notice of such cancellation or change has been delivered to the Engineer; SCS Engineers, and to the Owner.

Insured: ____________________________________________

Address: ___________________________________________

Status of Insured ___ Corporation ___ Partnership ___ Individual

Location of Operations Insured: ___________________________

Description of Work: __________________________________

INSURANCE POLICIES IN FORCE

<table>
<thead>
<tr>
<th>Forms of Coverage</th>
<th>Policy Number</th>
<th>Expiration Date</th>
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<tbody>
<tr>
<td>*Worker’s Compensation/Employers’ Liability</td>
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<tr>
<td>+Comprehensive Automobile Liability</td>
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<tr>
<td>Comprehensive General Liability</td>
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<td>*Worker's Compensation/Employers' Liability</td>
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<td>+Excess Liability</td>
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<td>Other (Please specify type)</td>
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POLICY INCLUDES COVERAGE FOR:

1. Additional Insured: Owner and Engineer
   YES   NO

   ______  ______

3. +All owned, hired, or non-owned automotive equipment used in connection with work done for the Owner.
   ______  ______

4. Contractual Liability
   ______  ______
5. Damage caused by explosion, collapse or structural injury, and damage to underground utilities.  
   ____  ____

6. Products/Completed Operations  
   ____  ____

7. Owners and Contractors Protective Liability  
   ____  ____

8. Personal Injury Liability  
   ____  ____

9. Excess Liability applies excess of:  
   (a) Employers' Liability  
      ____  ____
   (b) Comprehensive General Liability  
      ____  ____
   (c) Comprehensive Automobile Liability  
      ____  ____
   (d) Contractual Liability  
      ____  ____

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<tr>
<th>TYPES OF POLICY</th>
<th>FORMS OF COVERAGE</th>
<th>LIMITS OF LIABILITY</th>
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<tr>
<td>Workers' Compensation</td>
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<td>Disease</td>
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<td>Aggregate</td>
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OR

Comprehensive General
Liability

Bodily Injury

Property Damage

$______________ Each

Occurrence

Accident

Aggregate

OR

Combined Single
Limit BI/PD

$______________ Each

Occurrence

Aggregate

New Hanover County Secure Landfill
Cells 7-13 Expansion Project 00650 - 2

Certificate of Insurance
June 2017
Excess Liability Combined Single $__________ Aggregate

Other (Please Specify Type)_______________________________________________________

The Insurance Company hereby agrees to deliver, within ten (10) days, two (2) copies of the above policies to the Owner's Engineer when so requested.

NOTE: Entries on this certificate are limited to the Authorized Agent or Insurance Company Representative.

Date _____________________________ (SEAL) _________________________________

Insurance Company

Issued at _________________________   __________________________________________

Authorized Representative

Note that insurance requirements listed in Section 00500 – Agreement are the minimum requirements acceptable regardless of the listings on this form.

Insurance Agent or Company
- Send original and one copy to: SCS Engineers, Inc.
  5850 South Semoran Avenue
  Orlando, FL 32822

END OF SECTION
SECTION 00700
GENERAL CONDITIONS
INDEX

ARTICLE 1 - DEFINITIONS

ARTICLE 2 - PRELIMINARY MATTERS

ARTICLE 3 - CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

ARTICLE 5 - BONDS AND INSURANCE

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

ARTICLE 7 - OTHER WORK

ARTICLE 8 - OWNER'S RESPONSIBILITIES

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

ARTICLE 10 - CHANGES IN THE WORK

ARTICLE 11 - CHANGES OF THE CONTRACT PRICE

ARTICLE 12 - CHANGE OF CONTRACT TIME

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

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

ARTICLE 16 - MISCELLANEOUS
ARTICLE 1 - DEFINITIONS

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

1.1 **Addenda:** Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2 **Agreement:** The written contract between OWNER and CONTRACTOR covering the Work to be performed, Contract Price, Contract Time and other requirements; other contract documents are attached to the Agreement and made a part thereof as provided therein.

1.3 **Application for Payment:** The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.4 **Asbestos:** Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

1.5 **Bid:** The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6 **Bidding Documents:** The Contract Documents as existing at time of Bid.

1.7 **Bidding Requirements:** The Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form and the Bid Bond Form.

1.8 **Bonds:** Bid, performance and payment bonds and other instruments of security.

1.9 **Change Order:** A document recommended by the ENGINEER which is signed by CONTRACTOR and OWNER and directs or authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

1.10 **Contract Documents:** The Advertisement or Invitation to Bid, Instructions to Bidders, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (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 Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders and ENGINEER's written interpretations and clarifications issued pursuant to paragraphs 3.5 and 3.6 on or after the Effective Date of the Agreement.

1.11 **Contract Price:** The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1, in the case of Unit Price Work).

1.12 **Contract Times:** The numbers of days (computed as provided in paragraph 16.2) or the dates stated in the Agreement (i) to achieve Substantial Completion and (ii) to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13.

1.13 **CONTRACTOR:** The person, firm or corporation with whom OWNER has entered into the Agreement.

1.14 **Defective:** An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or acceptance referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.8 or 14.10).

1.15 **Drawings:** The Drawings which show the character, extent and scope of the Work to be performed by the CONTRACTOR and which have been prepared or accepted by ENGINEER and are referred to in the Contract Documents.

1.16 **Effective Date of the Agreement:** The date indicated in the Agreement on which it becomes effective, 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.

1.17 **ENGINEER:** The person, firm or corporation named as such in the Agreement, or as otherwise designated by the OWNER.

1.18 **ENGINEER's Consultant:** A person, firm or corporation having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.
1.19 **Field Order:** A written order issued by ENGINEER which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or Contract Times.

1.20 **General Requirements:** Sections of Division 1 of the Specifications.

1.21 **Hazardous Waste:** The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

1.22 **Laws and Regulations:** Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.23 **Liens:** Charges, security interests or encumbrances upon real property or personal property.

1.24 **Milestone:** A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.25 **Notice of Award:** The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

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

1.27 **OWNER:** The public body or authority, corporation, association, firm or person with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

1.28 **Partial Utilization:** Use by OWNER of a substantially completed portion of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.29 **PCBs:** Polychlorinated biphenyls.

1.30 **Petroleum:** Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.
1.31 **Project:** The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.32 **Project Manual:** The title of the bound documentary information prepared for a construction project and includes bidding requirements, conditions of contract and product specifications.

1.33 **Radio Active Material:** Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

1.34 **Resident Project Representative:** The authorized representative of ENGINEER or OWNER who may be assigned to the site or any part thereof.

1.35 **Samples:** Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.36 **Shop Drawings:** All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR to illustrate some portion of the Work, including illustrations, brochures, standard schedules, performance charts, instructions, diagrams, and other such information furnished by manufacturers and suppliers, and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work. Shop drawings are not Drawings as so defined and are not Contract Documents.

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

1.38 **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.

1.39 **Substantial Completion:** The degree of completion at which, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, the Work (or a specified part thereof) is sufficiently complete, that it can be utilized for the purposes for which it is intended; or if there be no such certificate issued, when Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
1.40 **Supplementary Conditions:** The part of the Contract Documents which amends or supplements these General Conditions.

1.41 **Supplier:** A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with CONTRACTOR or any Subcontractors to furnish materials or equipment to be incorporated in the WORK by CONTRACTOR or Subcontractor.

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

1.43 **Unit Price Work:** Work to be paid for on the basis of unit prices.

1.44 **Work:** The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing services, furnishing labor, furnishing and incorporating materials and equipment into the construction, and furnishing services and documents all as required by the Contract Documents.

1.45 **Work Change Directive:** A written directive to CONTRACTOR, recommended by ENGINEER and signed by OWNER, issued on or after the Effective Date of the Agreement 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 as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.23. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive 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 Times as provided in paragraph 10.1.

1.46 **Written Amendment:** A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

**ARTICLE 2 - PRELIMINARY MATTERS**

**Delivery of Bonds and Insurance Certificates**

2.1 When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.
in accordance with paragraph 5.1. The executed Agreements shall also be accompanied by certificates showing the existence of insurance (and other evidence of insurance required by OWNER and/or the Contract Documents) which CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.3 and 5.4.

Copies of Documents:

2.2 After the Contract has been executed, the Contractor will be furnished one (1) CD of topo, five (5) complete sets of drawings (24" x 36") and one (1) copy of the Project Manual (Contract Requirements and Specifications) and all addenda.

The Contractor shall furnish each of the subcontractors, manufacturers, and material men such copies of the Contract Documents as may be required for their work. All copies of the Contract Documents shall be printed from the reproductive sets furnished to the Contractor. All costs of reproduction and printing shall be borne by the Contractor.

Commencement of Contract Times - Notice to Proceed

2.3 The Contract Times will commence to run on the date indicated in the Notice to Proceed. Unless otherwise specified in the Supplementary Conditions, a Notice to Proceed will be issued to the CONTRACTOR within thirty days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the ninetieth day after the day of the Bid opening or the starting date indicated therein will not be later than the sixtieth day after the Effective Date of the Agreement.

Starting the Work

2.4 CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no work shall be done at the site prior to that date.

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 ENGINEER any conflict, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall be liable for failure to report to OWNER or ENGINEER any conflict, ambiguity or discrepancy in the Contract Documents, or other such conditions of the Work which CONTRACTOR knew or reasonably should have known.

Preconstruction Submittals
2.6 Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1 A preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents.

2.6.2 A preliminary schedule of Shop Drawing and Sample submittals, listing each required submittal and times for submitting, reviewing and processing such submittal;

2.6.3 A preliminary schedule of values for all of the Work which shall include quantities and prices of items aggregating the Contract Price and shall subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices shall include an appropriate amount of overhead and profit applicable to each item of Work.

2.6.4 The anticipated monthly payments to become due to the CONTRACTOR.

Preconstruction Conference

2.7 Before any Work at the site is started, a conference attended by 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 submittals, for processing Applications for Payment, for maintaining required records and to establish a working understanding among the parties as to the Work.

Acceptable Schedules

2.8 Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to review for ENGINEER's acceptability of and to finalize the schedules submitted in accordance with paragraph 2.6. The CONTRACTOR shall make required corrections and adjustments and resubmit the schedules. No Application for Payment will be accepted and no progress payment made to CONTRACTOR until the schedules are submitted and acceptable to ENGINEER as provided below. The progress schedule shall be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from full responsibility therefor. The progress schedule shall show a completion date corresponding to the times or dates stated in the Agreement and described in paragraph 1.12. The schedule of Shop Drawing and Sample submittals shall be acceptable to ENGINEER as providing a workable arrangement for
reviewing and processing the required submittals. The schedule of values shall be acceptable to ENGINEER as to form and substance.

ARTICLE 3 - CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

Contract Documents

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.

Intent

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 or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for. When words or phrases which have a well-known technical, construction industry or trade meaning are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3 Standards, Standard Specifications and Conflicts Therewith

3.3.1 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 be specific or by implication, 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 of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2 If, during the performance of the Work, CONTRACTOR discovers any conflict, ambiguity or discrepancy in the Contract Documents, or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work, or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, CONTRACTOR shall so report to ENGINEER in writing at once and shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6, provided, however, CONTRACTOR shall not be liable to OWNER or
ENGINEER for failure to report any such conflict, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

3.3.3 Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, ambiguity or discrepancy between the provisions of the Contract Documents and:

3.3.3.1 The provisions of any standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents);

3.3.3.2 Or the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.3.4 Except as otherwise specifically stated in the Contract Documents, or as may be provided by amendment or supplement thereto, the Agreement shall take precedence over all Contract Documents. In resolving any conflict, inconsistency, ambiguity or discrepancy among the provisions of the various component documents of the Contract Documents, the various documents shall be given precedence as follows: Agreement Modifications, Agreement, Addenda, Technical Specifications, Supplementary Conditions, General Conditions, Drawings. In the event of inconsistencies in the same order of precedence, the item or Work of better quality and/or meeting the more stringent requirements will be required. Full size details shall take precedence over scale drawings and large scale drawings shall take precedence over small scale drawings. Dimensions given in figures shall take precedence over scaled dimensions. Actual job dimensions shall take precedence over scale and figure dimensions on the Drawings.

3.3.5 No provision of any referenced standard, specification, manual, code or instruction (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 subcontractors, consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER, or any of ENGINEER's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.
Definitions of Terms

3.4 Whenever in the Contract Documents the term "as ordered", "as directed", "as required", "as allowed", "as accepted", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgement of ENGINEER as to the Work, it is intended that such requirement, direction, review, or judgement will be solely to evaluate, in general, the completed Work for compliance with requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

Amending Contract Documents

3.5 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:

3.5.1 a formal Written Amendment,

3.5.2 a Change Order (pursuant to paragraph 10.4), or

3.5.3 a Work Change Directive (pursuant to paragraph 10.1).

Supplementing Contract Documents

3.6 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:

3.6.1 A Field Order (pursuant to paragraph 9.5),

3.6.2 ENGINEER's acceptance of a Shop Drawing or sample (pursuant to paragraphs 6.26 and 6.27), or

3.6.3 ENGINEER's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents

3.7 CONTRACTOR, or any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with
OWNER shall neither have nor acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

Availability of Lands

4.1 OWNER will furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. Upon reasonable written request, OWNER will furnish CONTRACTOR with a correct statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's lien against such lands in accordance with applicable Laws and Regulations. OWNER shall identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. 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. If CONTRACTOR and OWNER are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in OWNER's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2 Subsurface and Physical Conditions

4.2.1 Reports and Drawings: Reference is made to the Supplementary Conditions for identification of:

4.2.1.1 Reports of Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by ENGINEER in preparation of the Contract Documents.

4.2.1.2 Drawings of Physical Conditions: Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by ENGINEER in preparation of the Contract Documents.
4.2.2 Limited Reliance on Reports and Drawings: CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

4.2.2.1 The completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto, or

4.2.2.2 Other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3 Any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3 Notice of Differing Conditions: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed is of such a nature as to establish 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 materially inaccurate, or

4.2.3.2 It requires a change in the Contract Documents, or

4.2.3.3 It differs materially from that shown or indicated in the Contract Documents, or

4.2.3.4 It differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then

CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), notify OWNER and ENGINEER in writing about the inaccuracy or difference. CONTRACTOR shall not further disturb such conditions or perform any work in connection therewith (except as aforesaid) until receipt of a written order to do so.
4.2.4 **ENGINEER's Review:** ENGINEER will promptly review the pertinent conditions, determine the necessity of OWNER's obtaining additional explorations or tests with respect thereto and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

4.2.5 Possible Contract Documents Change: If ENGINEER concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3, a Work Directive Change or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

4.2.6 Possible Price and Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Time, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in CONTRACTOR's cost of, or time required for performance of the Work., subject, however, to the following:

4.2.6.1 Such condition must meet any one or more of the categories described in paragraph 4.2.3;

4.2.6.2 A change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization of nor a condition precedent to entitlement to any such adjustment;

4.2.6.3 With respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.10 and 11.9; and

4.2.6.4 CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Times if;

4.2.6.4.1 CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a negotiated contract; or

4.2.6.4.2 The existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or
4.2.6.4.3 CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.2.3.

If OWNER and CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in Contract Price or Contract Times, a claim may be made therefor as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.3 **Physical Conditions -- 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 is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

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

4.3.1.2 The cost of all of the following shall be included in the Contract Price and the CONTRACTOR shall have full responsibility for (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such underground facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2 Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), identify the owner of such Underground Facility and give written notice thereof to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility to determine the extent, if any, to which the Contract Documents should be modified to reflect and document the consequences of the existence of the Underground Facility. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. During such time, CONTRACTOR shall be
responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20.

Reference Points

4.4 OWNER will provide engineering surveys to establish reference points for construction which in ENGINEER's judgement are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specified in the Contract Documents), shall protect and preserve the established reference points and shall make no changes or relocations without prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grade or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

4.5 Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1 OWNER will be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. OWNER will not be responsible for any such materials brought to the site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.

4.5.2 CONTRACTOR shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and (ii) notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. CONTRACTOR will not be required to resume Work in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a claim therefor as provided in Articles 11 and 12.
4.5.3 If after receipt of such special written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefor as provided in Articles 11 and 12. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

4.5.4 To the fullest extent permitted by Laws and Regulations, OWNER will indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from such hazardous condition, provided that: (i) any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (ii) nothing in this subparagraph 4.5.4 shall obligate OWNER to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

4.5.5 The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCB’s, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5 - BONDS AND INSURANCE

Performance, Payment 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 CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as otherwise provided by Law or Regulation 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 the Contract Documents except as provided otherwise by Laws and Regulations, and shall 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 Government Financial Operations, U.S. Department of Treasury. All Bonds signed by an
agent must be accompanied by a certified copy of such agent's authority to act. Such agent shall be resident in the County where the Project is located or in such other Counties that are acceptable to OWNER.

5.1.1 Performance and payment bonds shall mean Public Construction Bonds. Public Construction Bonds executed as part of the Contract shall be by a corporate surety authorized to do business in the State of Florida. All bids signed by an agent must be accompanied by a certified copy of authority to act.

Bond and Surety Substitution

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 ten days thereafter substitute another Bond and Surety, both of which must be acceptable to OWNER.

5.3 Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1 All Bonds and insurance required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required.

5.3.2 All surety companies furnishing bid, performance, payment or other type of bonds shall meet the following requirements:

5.3.2.1 The Surety shall be rated as "A" or better as to General Policyholders Rating and Class X or better as to Financial Category by Best's Key Rating Guide, published by Alfred M. Best Company, Inc., of 75 Fulton Street, New York, New York, 10038.

5.3.2.2 The bonding limit of the Surety shall not exceed ten percent (10%) of the policyholder surplus (capital and surplus) as listed by the aforementioned Best's Key Rating Guide, on any one risk (penalty or amount of any one bond).

5.3.2.3 The Surety shall be subject to approval by the OWNER and may be rejected without cause, in the same manner that bids may be rejected.

5.3.2.4 Policy Holders Surplus shall be ten (10) times the amount of any one bond.
5.3.2.5 Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.3.3 CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain in accordance with paragraph 5.4.

CONTRACTOR's Liability Insurance

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

The limits of liability for the insurance required by paragraph 5.4 of the General Conditions shall provide coverage as provided in Section 00500

Property Insurance

5.5 CONTRACTOR shall purchase and maintain until final payment property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as may be provided in these Supplementary Conditions or required by Laws and Regulations) provided that such deductible not exceed as provided in Section 00500. This insurance shall include the interests of OWNER, CONTRACTOR Subcontractors, ENGINEER and Engineer's consultants in the Work (all of whom shall be listed as insureds or additional insured parties), shall insure against the perils of fire and extended coverage, shall include "all-risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, damage from pollution and such other perils as may be provided in these Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred.

Boiler and Machinery Insurance

5.6 **NOT REQUIRED UNDER THIS CONTRACT.** Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the
Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

Notice of Change

5.7 All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraphs 5.5 and 5.6 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.8.

5.8 Waiver of Rights

5.8.1 OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraphs 5.5 and 5.6 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance payable under any policy so issued.

5.8.2 In addition, OWNER waives all rights against CONTRACTOR, Subcontractor, ENGINEER, ENGINEER's Consultants and the officers, directors, employees and agents of any of them, for:

5.8.2.1 Loss due to business interruption, loss of use or other consequential loss extending beyond direct physical loss or damage to OWNER's
property or the Work caused by, arising out of or resulting from fire or other peril; and

5.8.2.2 Loss or damage to the completed Project or part thereof caused by, arising out of or resulting from fire or other insured peril covered by any property insurance maintained on the completed Project or part thereof during partial utilization pursuant to paragraph 14.10, after substantial completion pursuant to paragraph 14.8 or after final payment pursuant to paragraph 14.13.

Any insurance policy covering any loss, damage or consequential loss referred to in this paragraph 5.8.2 shall contain provisions to the effect that in the event of payment of any such loss, damage or consequential loss the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder.

Acceptance of Bonds and Insurance

5.9 If OWNER has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by CONTRACTOR in accordance with Article 5 on the basis of non-conformance with the Contract Documents, OWNER will so notify CONTRACTOR in writing within ten days after receipt of the certificates (or other evidence requested) required by paragraph 2.1. CONTRACTOR shall provide to the OWNER such additional information in respect of insurance provided as the OWNER may reasonably request. If CONTRACTOR fails to correct the deficiency and does not purchase and maintain all of the Bonds and insurance required of the CONTRACTOR by the Contract Documents, then the OWNER, without prejudice to any other right or remedy, may elect to obtain equivalent Bonds and insurance to protect OWNER's interests at the expense of the CONTRACTOR.

5.9.1 CONTRACTOR shall not be given Notice to Proceed under this Contract until he has obtained all the insurance required by the Contract Documents and such insurance has been approved by OWNER.

5.9.2 CONTRACTOR shall not allow a Subcontractor to work on a project without either Subcontractor carrying his own Workers Compensation and Liability insurance or CONTRACTOR covering Subcontractor under his policies. The policy is the same for each succeeding sub-tier contractor. OWNER may request proof of such coverage for any Subcontractor at anytime during the project.

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 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 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

6.1. CONTRACTOR shall supervise, inspect and direct the WORK competently 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, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, methods, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

Superintendent

6.2 CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent shall 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 and Work Hours

6.3 CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours.

6.3.1 Regular working hours shall be a 10-hour period (including a thirty-minute lunch) to be 7:00 a.m. to 5:00 p.m. - 6 days per week except holidays. This period may change with the approval of the OWNER and ENGINEER at least 72 hours prior to the proposed change. Requests to work during other than regular working hours must be submitted to the ENGINEER at least 72 hours in advance of the period proposed for such overtime work and shall set forth the
proposed schedule for overtime work to give ENGINEER sample time to arrange for his personnel to be at the site of the work.

6.3.2 CONTRACTOR shall pay for the additional engineering charges to the OWNER on account of the overtime work which may be authorized under the provision of Paragraph 6.3.1. Such additional engineering charges shall be a subsidiary obligation of CONTRACTOR and no extra payment shall be made by OWNER on account of such overtime work. ENGINEERING overtime charges shall be calculated for those hours in excess of 10 hours per day or 60 hours per week when it is deemed necessary by the ENGINEER, that the ENGINEER’s presence is required to observe the work for observation or record purposes. These charges shall be in accordance with the terms of ENGINEER's Agreement with the OWNER. For estimating purposes, a base hourly rate of $95 per hour shall be used for each observer.

Responsibility for Materials and Equipment

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 furnishing, performance, testing, start-up and completion of the Work.

6.4.1 All water for testing, flushing and construction shall be furnished by the CONTRACTOR. It shall be available by connecting to the OWNER's water system, on-site borrow pits, other surface water locations, or at a point approved by the OWNER. The OWNER shall charge the CONTRACTOR for water used in performing the above functions in accordance with the OWNER's established rate schedule. There shall be installed in each and every connection to the OWNER's water supply a backflow preventer meeting the requirements of ANSI A40.6, latest revision at each and every connection. CONTRACTOR shall be required to meter all water used. When available, plant effluent (treated wastewater) may be used for flushing and testing.

Quality of Materials and Equipment

6.5 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, erected, used, cleaned and conditioned
in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents.

**Progress Schedule**

6.6 CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.8 as it may be adjusted from time to time as provided below:

6.6.1 CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.8) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments shall conform generally to the progress schedule then in effect and additionally will comply with any provision of the General Requirements applicable thereto.

6.6.2 Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

**Substitutes or "Or-Equal" Items**

6.7 Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or equal" item or no substitution is permitted, other items of material or equipment or materials or equipment of other Suppliers may be accepted by ENGINEER under the following circumstances:

6.7.1 "Or-Equal": If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and acceptance of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2 Substitute Items: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under subparagraph 6.7.1.1, it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that
the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor.

The procedure for review by ENGINEER will include the following as supplemented in the General Requirements: Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will 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 costs or credits 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. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.

6.7.1.3 CONTRACTOR's Expense: All data to be provided by CONTRACTOR in support of any proposed "or equal" or substitute item shall be at CONTRACTOR's expense.

6.7.2 Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for.
by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3 ENGINEER's Evaluation: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. ENGINEER will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance which will be evidenced by either a Change Order or an accepted Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any "or equal" or substitute. ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitutions proposed or submitted by CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER accepts a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse ENGINEER for the charges of ENGINEER and ENGINEER's consultants for evaluating each such proposed substitute item.

6.8 Employment of Subcontractors, Suppliers and Others

6.8.1 CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has 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 the specified date prior to the Effective Date of the Agreement 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 the cost 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.

6.8.3 CONTRACTOR shall identify and provide information on Subcontractors, Suppliers and other persons or organizations which shall be used by CONTRACTOR in accordance with requirements of the Bidding Documents.

6.9 Responsibility for Subcontractors, Suppliers and Others

6.9.1 CONTRACTOR shall be fully responsible to OWNER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing 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 for the benefit of any such Subcontractor, Supplier or other person or organization 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 see to the payment of any monies due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.9.2 CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.

Scope of Subcontract Work

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.

Subcontractor Agreements

6.11 All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER.
Patent Fees and Royalties

6.12 CONTRACTOR shall pay all license fees and royalties and 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 which 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 or ENGINEER 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. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER, ENGINEER's Consultants and officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, damages, losses, and expenses arising out of or resulting from 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. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses, including revising Drawings and/or Specifications as required by the permitting agencies. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or if there are no Bids on the Effective Date of the Agreement. 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 such as plant investment fees. The OWNER has applied for or has secured permits and/or licenses for the project from the following agency:

State of North Carolina
Department of Environmental Quality
Division of Waste Management

That include: Solid Waste Management Facility Construction Permit.
Soil and Erosion Control Permit
Stormwater Management Permit

Prior to the start of construction, the Contractor shall have obtained with the assistance of the Owner, the following item:
Building Department Permits

6.14 Laws and Regulations

6.14.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable 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 performs any Work knowing or having reason to know that it is contrary to such Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages arising out of or resulting therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with such Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.3.2.

Taxes

6.15 CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work. Detailed reports of state taxes paid for materials will be provided to the OWNER with each pay request.

Use 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-way, 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 adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant and anyone directly or indirectly employed by any of them from and against all claims, costs, damages and losses arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER or other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.
Control of Waste Materials

6.17 During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all remaining 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 at Substantial Completion of the Work. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

Loading or Stressing Completed Work

6.18 CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the 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 Change Directives, 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 accepted Samples and a counterpart of all Shop Drawings reviewed and found satisfactory for construction shall be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings shall be delivered to ENGINEER for OWNER. Final payment and acceptance of the project will be withheld until delivery of the documents is made to the ENGINEER.

Safety and Protection

6.20 CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the 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 persons on the Work site who may be affected by the Work;

6.20.2 all 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, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction 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 may 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, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and 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).

Safety Representative

6.21 CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

Hazard Communication Programs

6.22 CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

Emergencies
6.23 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 from ENGINEER or OWNER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by the CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.24 Shop Drawings and Samples

6.24.1 CONTRACTOR shall submit Shop Drawings to ENGINEER for review in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9). Shop Drawings shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submittal. Shop Drawings submitted without this stamp or specific written indication will be returned without action. All submittals shall be identified as ENGINEER may require and in the number of copies specified in the General Requirements. 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 show ENGINEER the materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2 CONTRACTOR shall also submit Samples to ENGINEER for review in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample shall be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.26. The number of each Sample to be submitted shall be as specified in the Specifications.

6.25 Submittal Procedures

6.25.1 Before submitting each Shop Drawing or Sample CONTRACTOR shall have determined and verified:

6.25.1.1 all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto,
6.25.1.2 all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

6.25.1.3 all information relative to CONTRACTOR's responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

CONTRACTOR shall also have reviewed and 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 Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and acceptance of that submittal.

6.25.3 At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in written communication separate from the submittal, and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review of each such variation.

Submittal Review

6.26 ENGINEER will review Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by ENGINEER as required by paragraph 2.8 with time of review up to 30 days. ENGINEER's review will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER's review will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate review 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 submittals. Shop Drawings and submittal data will be
CONTRACTOR's Responsibility

6.27 ENGINEER's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.25.3 and ENGINEER has acted on each such variation by a specific written notation incorporated in or accompanying the Shop Drawing or Sample; nor will any action by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for complying with the provisions of paragraph 6.25.1.

Work Performed Prior to Review

6.28 Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals accepted by ENGINEER, as required by paragraph 2.8, any related Work performed prior to ENGINEER's review of the pertinent submittal will be at the sole expense and the sole responsibility 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.

6.30 CONTRACTOR's General Warranty and Guarantee

6.30.1 CONTRACTOR warrants and guarantees to OWNER, ENGINEER and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

- abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers;
- normal wear and tear under normal usage.

6.30.2 CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract
Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

6.30.2.1 observations by ENGINEER;

6.30.2.2 recommendation of any progress or final payment by ENGINEER;

6.30.2.3 the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

6.30.2.4 use or occupancy of the Work or any part thereof by OWNER;

6.30.2.5 any acceptance by OWNER or any failure to do so;

6.30.2.6 any review and acceptance of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13;

6.30.2.7 any inspection, test or acceptance by others; or

6.30.2.8 any correction of defective Work by OWNER.

**Indemnification**

6.33 To the fullest extent permitted by Laws and Regulations CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, damages, losses and expenses, (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of, or resulting from the performance of the Work, provided that any such claim, cost, damage, loss or expense (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom and (ii) is caused in whole or in part by any negligent act or omission of CONTRACTOR, its Subcontractors or Suppliers, or any person or organization directly or indirectly employed by any of them to perform or furnish 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 any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Law and Regulations regardless of the negligence of any such person or entity. The CONTRACTOR and OWNER agree that by exchange of Ten Dollars ($10.00) of the Contract Price payable by the OWNER to the CONTRACTOR for performance of the Work that the Contractor acknowledges the specific consideration of the indemnification provided herein.

**Obligation Not Limited by Employee Benefits Acts**
6.32 In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representatives of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.31 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, Supplier or other person or organization under workers’ compensation acts, disability benefit acts or other employee benefit acts.

ENGINEER's Errors and Omissions

6.33 The indemnification obligations of CONTRACTOR under paragraph 6.31 shall not extend to the liability of ENGINEER, ENGINEER's Consultants, officers, directors, agents or employees caused by the professional negligence, errors or omissions of any of them.

Survival of Obligations

6.34 All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

ARTICLE 7 - OTHER WORK

Related Work at Site

7.1 OWNER may perform other work related to the Project at the site with OWNER's own forces, or let other direct contracts therefor which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to CONTRACTOR prior to starting any such other work.

CONTRACTOR's Obligations

7.2 CONTRACTOR shall afford any other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the additional work with OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, 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 ENGINEER and others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

Inspection of Related Work by Others

7.3 If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's work. CONTRACTOR's failure to make such report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent or nonapparent defects and deficiencies in such other work.

Coordination

7.4 If OWNER contracts with others for the performance of other work on the Project at the site, the following will be set forth in Supplementary Conditions:

7.4.1 The person, firm or organization that will have authority and responsibility for coordination of the activities among the various prime contractors will be identified,

7.4.2 The specific matters to be covered by such authority and responsibility will be itemized,

7.4.3 The extent of such authority and responsibilities will be provided.

If the above is not provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

Communication with CONTRACTOR

8.1 Except as otherwise provided in the Contract Documents, OWNER will issue all communications to CONTRACTOR through ENGINEER.

Replacement of ENGINEER
8.2 In case of termination of the employment of ENGINEER, OWNER will appoint a person, firm or corporation whose status under the Contract Documents shall be that of the former ENGINEER.

Prompt Payments

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

Lands and Data

8.4 OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and drawings of physical conditions in existing structures at or contiguous to the site which have been utilized by ENGINEER in preparing the Contract Documents.

Change Orders

8.5 OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

Inspections and Tests

8.6 OWNER's responsibility in respect of certain inspections, tests and acceptances is set forth in paragraph 13.4.

Suspension or Termination of Work

8.7 In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

Responsibilities Not OWNER's

8.8 The OWNER will not supervise, direct or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.
Hazardous Materials

8.9 OWNER's responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative

9.1 ENGINEER (or ENGINEER's assistant or project representative at the site) will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site

9.2 ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe as an experienced and qualified design professional the progress and quality of the various aspects of the executed Work. Based on information obtained during such visits and observations, ENGINEER will endeavor for the benefit of OWNER to determine, in general, if the Work is proceeding in substantial accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of such visits and on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defects and deficiencies in the Work. ENGINEER's visits and on-site observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of ENGINEER's on-site visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representation

9.3 If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative (RPR) to assist ENGINEER in providing more continuous observation of the Work. The responsibilities and authority, and limitations thereon, of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the site who is not ENGINEER's Consultant, agent or employee, the responsibilities
and authority and limitations thereon of such other person will be as provided in the Supplementary Conditions.

Clarifications and Interpretations

9.4 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 ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications will be binding on OWNER and CONTRACTOR. If CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Article 11 or Article 12.

Authorized Variations in Work

9.5 ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are consistent with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER, and also on CONTRACTOR who shall perform the Work involved promptly. If CONTRACTOR believes that a Field Order justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

Rejecting Defective Work

9.6 ENGINEER will have authority to reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have 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. ENGINEER will notify the CONTRACTOR in writing of any disapproval and/or rejection.

Shop Drawings and Samples

9.7 In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraphs 6.24 through 6.28 inclusive.

Change Orders
9.8  In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11 and 12.

**Certification of Payments**

9.9  In connection with ENGINEER's authority as to Applications for Payment, etc., see Article 14.

**Determination for Unit Prices**

9.10  ENGINEER will verify and/or determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decisions thereon will be final and binding upon OWNER and CONTRACTOR.

**Decisions on Disputes**

9.11  ENGINEER 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 and furnishing of the Work and claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times shall be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph, which ENGINEER will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter shall be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty days) after the start of such occurrence or event giving rise thereto, and written supporting data shall be submitted to ENGINEER and the other party within sixty days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of the claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR.
ENGINEER's Liability

9.12 When functioning as interpreter under paragraphs 9.10 and 9.11, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 and 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter.

9.13 Limitations on ENGINEER's Responsibilities

9.13.1 Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by ENGINEER shall create, impose or give rise to any duty owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them.

9.13.2 ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3 ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4 ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and acceptances and other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and acceptances that the results certified indicate compliance with, the Contract Documents.
9.13.5 The limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to ENGINEER's Consultants, Resident Project Representative and assistants.

ARTICLE 10 - CHANGES IN THE WORK

OWNER's Option to Change Scope

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. Such additions, deletions or revisions will be authorized by a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which shall be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided). Within five (5) days after receipt of a Work Change Directive authorizing additions, deletions or revisions to the Work, the CONTRACTOR shall submit therefor a price proposal and a proposal for adjustment of Contract Time, if any.

Disagreement as to Adjustments

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

Limits of Adjustments

10.3 CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.5 and 3.6, except in the case of an emergency as provided in paragraph 6.23, or in the case of uncovering Work as provided in paragraph 13.9.

Change Orders

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

10.4.1 changes in the Work which are ordered by OWNER pursuant to paragraph 10.1, are required because of acceptance of defective Work under paragraph 13.13 or correcting defective Work under paragraph 13.14, or are agreed to by the parties:
10.4.2 changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3 changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

provided that, in lieu of executing any such Change Order (or Written Amendment), an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.29.

10.5 At anytime, ENGINEER may request a quotation from CONTRACTOR for a proposed change in the Work. Within twenty-one (21) calendar days after receipt of a request for a quotation for a proposed change, CONTRACTOR shall submit a written and detailed proposal for an increase or decrease in the Contract Price or Contract Time for the proposed Change. Engineer shall have twenty-one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in accordance with Articles 11 and 12 and in sufficient detail reasonably to permit an analysis by ENGINEER of all material, labor, equipment, subcontract, and overhead costs and fees and shall cover all Work involved in the change, whether such Work was deleted, added, changed, or impacted. Any amount claimed for subcontracts shall be similarly supported. Itemized schedule adjustments shall be in sufficient detail to permit an analysis of the impact in accordance with Section 01310 of the General Requirements. Notwithstanding the request for quotation, CONTRACTOR shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed quotation will be considered non-prejudicial as defined in the Supplementary Conditions.

10.6 The adjustment in Contract Price and/or Contract Time stated in a Change Order shall comprise the total price and/or time adjustment due or owed the CONTRACTOR for the work or changes defined in the Change Order. By executing the Change Order, the CONTRACTOR acknowledges and agrees that the stipulated price and/or time adjustments include the costs and delays for all work contained in the Change Order, including costs and delays associated with the interruption of schedules, extended including costs and delays associated with the interruption of schedules, extended overheads, delay, and cumulative impacts or ripple effect on all other non-affected work under this contract. Signing of the Change Order constitutes full and mutual accord and satisfaction for the adjustment in contract price or time as a result of increases or decreases in costs and time of performance caused directly and indirectly from the change, subject to the current scope of the entire work as set forth in the Contract Documents. Acceptance of the waiver constitutes an agreement between OWNER and CONTRACTOR that the Change Order represents an equitable adjustment to the
Contract, and that CONTRACTOR will waive all rights to file a claim on this Change Order after it is properly executed.

Notification of Surety

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

ARTICLE 11 - CHANGES OF THE CONTRACT PRICE

Contract Price

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

Price Adjustment Procedure

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an adjustment in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the start of the occurrence or the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after such occurrence or event (unless ENGINEER allows an additional period of time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11 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 paragraph 11.2.

Value of Price Adjustment

11.3 The value of any Work covered by a Change Order or of any claim for an adjustment 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 price to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1 through 11.9.3, inclusive).

11.3.2 Where the Work involved is not covered by unit prices contained in the Contract Documents, by mutual acceptance of a lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2.1).

11.3.3 Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2, on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR's Fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work

11.4 The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5;

11.4.1 Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

11.4.2 Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.
11.4.3 Payments made by CONTRACTOR to the Subcontractors for Work performed or furnished by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids, if any, will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in paragraphs 11.4, 11.5, 11.6 and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4 Cost of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5 Supplemental costs including the following:

11.4.5.1 The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2 Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR.

11.4.5.3 Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements, approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof, all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work. Rental of CONTRACTOR's equipment at the site shall be for hours used only. Rental of non-owned equipment shall be the minimum rental costs plus costs of transportation, unloading, etc. for the day or period in which the equipment is used, plus the hours used beyond the minimum number included in the minimum rental costs.
11.4.5.4 Sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5 Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6 Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work, provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7 The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8 Minor expenses such as faxes, telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9 Cost of premiums for additional Bonds and insurance required because of changes in the Work.

Cost of the Work Exclusions

11.5 The term Cost of the Work shall not include any of the following:

11.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 11.4.4, all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.
11.5.2 Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.

11.5.3 Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

11.5.4 Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5 Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

11.5.6 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

**CONTRACTOR's Fee**

11.6 The CONTRACTOR's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1 a mutually acceptable fixed fee; or

11.6.2 if a fixed fee is not agreed upon, a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1 for costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR's Fee shall be fifteen percent;

11.6.2.2 for costs incurred under paragraph 11.4.3, the CONTRACTOR's Fee shall be five percent;

11.6.2.3 where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 11.4.1, 11.4.2, 11.4.3 and 11.6.2 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of fifteen percent of the costs incurred by such
Subcontractor under paragraphs 11.4.1 and 11.4.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

11.6.2.4 no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5, and 11.5;

11.6.2.5 the amount of credit to be allowed by CONTRACTOR to OWNER for any such change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's Fee by an amount equal to the percentage of Paragraphs 11.6.2.1 through 11.6.2.4 of such net decrease; and

11.6.2.6 when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's Fee shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.4 inclusive.

Cost of the Work Records

11.7 Whenever the cost of any Work is to be determined pursuant to paragraph 11.4 or 11.5, CONTRACTOR shall establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowances

11.8 It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

11.8.1 The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and

11.8.2 CONTRACTOR's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any of the foregoing will be valid.
Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.9 Unit Price Work

11.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially 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 of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. 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 ENGINEER in accordance with Paragraph 9.10

11.9.2 Each 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.

11.9.3 If the actual quantity of any item of Unit Price Work performed by CONTRACTOR varies from the estimated quantity of such item by twenty-five percent (25%) or less, payment for the Unit Price Work will be made at the Contract Unit Price. If the actual quantity varies by more than twenty-five percent (25%), the compensation payable to the CONTRACTOR will be the subject of review by the CONTRACTOR and the ENGINEER and an equitable adjustment will be made in accordance with Article 11 to credit the OWNER with any reduction in cost or to compensate the CONTRACTOR for any increase in cost resulting from variations between estimated and actual quantities.

ARTICLE 12 - CHANGE OF CONTRACT TIME

Notice of Time Change Claim

12.1 The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty 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 sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the 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 said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

Contract Time

12.2 All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of Article 12 shall exclude recovery for damages for delay by either party.

Delays Beyond Control of CONTRACTOR

12.3 Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of the CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to time lost due to such delays if a claim is made therefor as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts or neglect by OWNER or utility owners or other contractors performing other work as contemplated by Article 7, or to fires, floods, labor disputes, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of the CONTRACTOR.

Delays Beyond Control of CONTRACTOR and OWNER

12.4 Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, flood, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

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

Notice of Defects
13.1 Prompt notice of all defective Work of which the OWNER or ENGINEER have actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected or accepted as provided in this Article 13.

**Access to Work**

13.2 OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

**Tests and Inspections**

13.3 CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or acceptances, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

**Independent Testing Laboratory**

13.4 OWNER will employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or acceptances required by the Contract Documents except:

13.4.1 for inspections, tests or acceptances covered by paragraph 13.5 below;

13.4.2 that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3 as otherwise specifically provided in the Contract Documents.

**Statutory Inspections and Tests**

13.5 If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or accepted by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or acceptances, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or acceptance. CONTRACTOR shall also be responsible for arranging and obtaining and, unless otherwise specified in the General Requirements, shall pay all costs in connection with any inspections, tests or acceptances required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs or equipment submitted for acceptance prior to CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all inspections, tests and acceptances...
in addition to the above which are required by the Contract Documents shall be paid by
OWNER (unless otherwise specified).

Work Covered Before Inspection

13.6 If any Work (including the work of others) that is to be inspected, tested or accepted is
covered without written concurrence of ENGINEER, it must, if requested by
ENGINEER, be uncovered for observation. Such uncovering Work shall be at
CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice
of CONTRACTOR's intention to cover the same and ENGINEER has not acted with
reasonable promptness in response to such notice.

CONTRACTOR's Responsibility

13.7 Neither observations by ENGINEER nor inspections, tests or acceptances by others shall
relieve CONTRACTOR from CONTRACTOR's obligations to perform the Work in
accordance with the Contract Documents.

Uncovering Work

13.8 If any Work is covered contrary to the requirements of the Contract Documents and/or
directive of ENGINEER, it must, if requested by ENGINEER, be uncovered for
ENGINEER's observations and replaced at CONTRACTOR's expense.

Payment for Uncovering Work

13.9 If ENGINEER considers it necessary or advisable that covered Work be observed by
ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request,
shall uncover, expose or otherwise make available for observation, inspection or testing
as ENGINEER may require, that portion of the Work in question, furnishing all
necessary labor, material and equipment. If it is found that such Work is defective,
CONTRACTOR shall pay all claims, costs, losses and damages caused by, arising out of
or resulting from such uncovering, exposure, observation, inspection and testing and of
satisfactory replacement or reconstruction, (including but not limited to fees and charges
of engineers, architects, attorneys and other professionals and costs of repair or
replacement of work of others), 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, may
make a claim therefor as provided in Article 11. If, however, such Work is not found to
be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an
extension of the Contract Times (or Milestones), or both, directly attributable to such
uncovering, exposure, observation, inspection, testing, replacement and reconstruction;
and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR
may make a claim therefor as provided in Articles 11 and 12.
Owner May Stop the Work

13.10 If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers to maintain the accepted progress schedule, intermediate milestones and Contract completion date or fails to supply suitable materials or equipment, or fails to furnish or 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; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

Correction or Removal of Defective Work

13.11 If required by ENGINEER, 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 Work that is not defective. CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and all costs of repair or replacement of work of others).

13.11.1 The CONTRACTOR shall not be entitled to an extension of the Contract Time for correcting or removing defective work.

13.12 Correction Period

13.12.1 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 provision 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, (i) correct such defective Work, or, if it has been rejected by OWNER, remove it from the site and replace it with Work that is not defective and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, 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 claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and all costs of repair or replacement of work of others) will be paid by CONTRACTOR.
13.12.2 In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Contract Documents.

13.12.3 Where defective Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Acceptance of Defective Work

13.13 If, instead of requiring correction or removal and replacement of defective Work, OWNER, upon ENGINEER's evaluation and recommendation, prefers to accept it, OWNER may do so. CONTRACTOR shall pay all claims, costs, losses and damages attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be accepted by ENGINEER as to reasonableness and to include but not limited to fees and charges of engineers, architects, attorneys and other professionals). If any such acceptance occurs prior to ENGINEER'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

13.14 If CONTRACTOR fails within a reasonable time after written notice of ENGINEER to proceed to correct and to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraphs 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 for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors and ENGINEER and ENGINEER's Consultants
access to the site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies will be charged against CONTRACTOR in an amount accepted as to reasonableness by ENGINEER, 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 claims, costs, losses and damages will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court 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 will not be allowed an extension of the Contract Times (or Milestones) because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values

14.1 The schedule of values established as provided in paragraph 2.8 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment

14.2 At least twenty days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER 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 requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, 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. The amount of retainage with respect to progress payments will be 10 percent except as otherwise provided in the Supplementary Conditions.
**CONTRACTOR's Warranty of Title**

14.3 CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any 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 Applications for Progress Payment**

14.4 ENGINEER, within ten days after receipt of each Application for Payment, will either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application. Thirty days after presentation of the Application for Payment with ENGINEER's recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by OWNER to CONTRACTOR.

**ENGINEER's Recommendation of Payment**

14.5 ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of the Work in progress as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules that the Work has progressed to the point indicated; that, to the best of ENGINEER's knowledge, information and belief;

14.5.1 the Work has progressed to the point indicated,

14.5.2 the quality of the Work is in substantial 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 test called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10, and to any other qualifications stated in the recommendation); and

14.5.3 the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled insofar as it is ENGINEER's responsibility to observe the Work.

However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that (i) 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 ENGINEER in the Contract Documents or (ii) that there may not be other
matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

ENGINEER Not Responsible for Performance

14.6 ENGINEER's recommendation of any payment, including final payment, shall not mean that ENGINEER is responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of Work, or for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

Refusal to Recommend or Make Payment

14.7 ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make such representations to OWNER. ENGINEER 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 ENGINEER's opinion to protect OWNER from loss because:

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

14.7.2 the Contract Price has been reduced by Written Amendment or Change Order,

14.7.3 OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.14, or

14.7.4 ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive.

OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

14.7.5 claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work,

14.7.6 liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens,

14.7.7 there are other items entitling OWNER to a set-off against the amount recommended,
14.7.8 OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1 through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive;

but OWNER must give CONTRACTOR within seven days written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

Substantial Completion

14.8 When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, 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, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix 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. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen days execute and deliver to OWNER 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 from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER 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 and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.
OWNERS RIGHT TO EXCLUDE CONTRACTOR

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

PARTIAL UTILIZATION

14.10 Use by OWNER at OWNER's option of any substantially completed part of the Work, which (i) has specifically been identified in the Contract Documents, or (ii) which OWNER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and useable part of the Work that can be used by OWNER for its intended purpose 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:

14.10.1 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 that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that said part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after such request, 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 OWNER and CONTRACTOR in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 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.

14.10.2 OWNER may at any time request CONTRACTOR in writing to 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 ENGINEER and within a reasonable time thereafter 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 items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in
writing to OWNER 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 OWNER 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 when 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 said list and to complete other related Work.

14.10.3 No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.6 in respect of property insurance.

Final Inspection

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

Final Application for Payment

14.12 After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents, all as required by the Contract Documents, and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.16), CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by paragraph 5.4.13, (ii) consent of surety, if any, to final payment, and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu of such releases or waivers of liens and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that (i) the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and (ii) 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. If any Subcontractor or Supplier fails to furnish a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

14.12.1 Notwithstanding any other provision of these Contract Documents to the contrary, OWNER and ENGINEER are under no duty or obligation whatsoever to any vendor, materials provider, subcontractor, laborer or other party to ensure that payments due and owing by the CONTRACTOR to any of them are or will be made. Such parties shall rely only on the CONTRACTOR's surety bonds for remedy of nonpayment by him.

Final Payment and Acceptance

14.13 If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation, as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.16. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. Thirty days after presentation to OWNER of the Application and accompanying documentation, in appropriate form and substance, and with ENGINEER's recommendation and notice of acceptability, the amount recommended by ENGINEER will become due and will be paid by OWNER to CONTRACTOR.

Delayed Final Completion

14.14 If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if ENGINEER so confirms, OWNER will, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the
Application for such payment. Such payment will be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

CONTRACTOR's Continuing Obligation

14.15 CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by ENGINEER, nor the issuance of a certificate of Substantial Completion, nor any payment by OWNER to CONTRACTOR under the Contract Documents, nor any use or occupancy of the Work or any part thereof by OWNER, nor any act of acceptance by OWNER nor any failure to do so, nor any review and acceptance of a Shop Drawing or sample submission, nor the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13, 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 (except as provided in paragraph 14.16).

Waiver of Claims

14.16 The making and acceptance of final payment will constitute:

14.16.1 a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.11, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

14.16.2 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 and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

OWNER May Terminate For Cause
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 the 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 at the time of filing, 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 the 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 an inability to pay its debts generally as they become due;

15.2.6 if CONTRACTOR persistently 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 2.8 as revised from time to time);

15.2.7 if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.8 if CONTRACTOR disregards the authority of ENGINEER; or

15.2.9 if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any) seven days' written notice and provided that CONTRACTOR does not remedy such occurrence 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 for which OWNER has paid CONTRACTOR but 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 all claims, costs, losses and damages sustained by OWNER arising out of or resulting from completing the Work (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court costs) such excess will be paid to CONTRACTOR. If such claims, costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses and damages incurred by OWNER will be reviewed as to reasonableness by ENGINEER and when accepted, incorporated in a Change Order, provided that when exercising any rights or remedies under this paragraph OWNER will not be required to obtain the lowest price for the Work performed.

**OWNER's Rights After Termination**

15.3 Where CONTRACTOR's services have been so terminated by OWNER, the 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.

**OWNER May Terminate Without Cause**

15.4 Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to abandon the Work and terminate the Agreement. In such case, CONTRACTOR will be paid (without duplication of any item):

15.4.1 for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2 for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3 for all costs, described in paragraphs 15.4.1 and 15.4.2 that are incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

15.4.4 for reasonable expenses directly attributable to termination.
CONTRACTOR will not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

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, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted, or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.4. In addition and in lieu of terminating the Agreement and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or OWNER has failed for thirty days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may upon seven days' written notice to OWNER and ENGINEER stop the Work until payment of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude CONTRACTOR from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping Work as permitted by this paragraph.

ARTICLE 16 - MISCELLANEOUS

Giving Notice

16.1 Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.2 Computation of 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 any such period falls on a Saturday or Sunday or on a day made a legal holiday by 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 next midnight shall constitute a day.
16.3 Should OWNER or CONTRACTOR suffer 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, claim 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 16.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

Cumulative Remedies

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 6.12, 6.16, 6.30, 6.31, 6.32, 13.1, 13.12, 13.14, 14.3 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 in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representations, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of the Agreement.

Submittals

16.5 The form of all submittals notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the ENGINEER. Reference is made to Section 00830 for the following forms which shall be conformed under this Contract:

Notice of Award

Notice to Proceed

Application for Payment

Shop Drawing Submittal

Change Order

Certificate of Substantial Completion
16.6 **Photographic Records**

16.6.1 The Contractor shall provide a monthly color aerial photographic record of construction progress, disturbed areas, and the borrow pit. This record shall consist of three (3) sets of four (4) pictures (north, south, east, and west) each 8" x 10" on 8-1/2" x 11" soft card stock, with left margin for three hole punch, color professional quality photographs. ENGINEER shall reserve the right to select the views to be photographed. A gummed label, 1" wide, shall be attached to the front of each picture, with typed record of date picture was taken, ENGINEER's project number or contract number, and brief description of times and activity covered in the picture. The back of each photo shall include project name, view orientation, date of photo and name of photographer.

16.6.2 The first sets of photographs to be submitted with Application for payment No. 1 will show: (1) The site prior to beginning construction; and (2) Construction progress for Payment No. 1. The flight date for each payment request shall be within 5 days or less before the end of the pay request period. After construction is complete and accepted by the Owner, Contractor will provide one final set of photographs of the completed project with his final application for payment. The cost of this work shall be pro rata included in the Contractor's bid. There is no separate bid line item for this work.

16.6.3 Polaroid or similar instant type photographs will not be acceptable.

**Disputes**

16.7 Disputes between OWNER and CONTRACTOR shall be arbitrated only if and to the extent agreed to by the parties at the time each dispute arises. The CONTRACTOR will carry on the Work and maintain the progress schedule during any dispute, regardless of how resolved, unless otherwise mutually agreed in writing. Venue for any litigation, at law or equity or arbitration, shall lie exclusively in New Hanover County, North Carolina. This Contract, or any provision hereof, shall be construed and interpreted, and any litigation arising therefrom, shall be governed by the laws of North Carolina.

**Professional Fees and Court Costs Included**

16.8 Whenever reference is made to "claims, costs, losses and damages," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

END OF SECTION
1.0 INTRODUCTION

A. These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below.

2.0 PRECONSTRUCTION CONFERENCE

A. In addition to the provisions of the General Conditions, Article 2.5, the following parties will be asked to attend the Preconstruction Conference; North Carolina Department of Environment and Natural Resources, Solid Waste Section.

3.0 CONSTRUCTION DETAILS

A. When reference is made to Drawings in the Technical Specifications, the reference shall include both the Drawings included under separate cover and the Drawings of Construction Details included herein.

4.0 COORDINATION OF PLANS, SPECIFICATIONS AND SPECIAL PROVISIONS

A. In case of discrepancy, computed dimensions shall govern over scaled dimensions; supplemental specifications shall govern over Standard Specifications; and Special Provisions shall govern over Drawings, Supplemental and Standard Specifications.

5.0 SUBSTITUTION OF EQUIPMENT

A. For all major equipment supplied, an affidavit signed by a corporate official must be submitted with the shop drawings stating that their equipment is equal to or exceeds the requirements of the specifications prepared by the Engineer and that its lifetime performance will be no less than equal to that obtainable from competitive equipment functioning in the same type of application and as manufactured by those companies identified in the specifications by the ENGINEER.

6.0 NOTICES

A. In conformance with the requirements of Article 6.40 and 6.41 Notice and Service of the General Conditions all notices or other papers required to be delivered by the Contractor to the OWNER shall be delivered to the office of the OWNER's ENGINEER, SCS Engineers, 5850 South Semoran Blvd, Orlando, FL, 32822

7.0 BORROW PIT

A. If the Contractor requires additional soil from Cells 7, 8A, 9, and 10A, the borrow pit located on the property to the south of the existing landfill will be available. Unless soils are brought in from off-site, if the south borrow pit is used, the contractor is to excavate to a depth of approximately six (6) feet below the water surface. Soils specifically for the drainage/protective layer must meet regulatory requirements.

END OF SECTION
SECTION 00830

CONTRACT FORMS

NOTICE OF AWARD
NOTICE TO PROCEED
CONTRACTOR’s VERIFICATION OF EXISTING CONDITIONS, DRAWINGS AND SPECIFICATIONS
REQUEST FOR INFORMATION
REQUEST FOR PROPOSAL
NON-COMPLIANCE NOTICE
FIELD ORDER FORM
WORK CHANGE DIRECTIVE
CHANGE ORDER FORM
WARRANTY OF TITLE
CERTIFICATE OF SUBSTANTIAL COMPLETION
SUBCONTRACTOR/VENDOR FINAL RELEASE OF LIEN
SHOP DRAWING SUBMITTAL
APPLICATION FOR PAYMENT
SUBCONTRACTOR/SUPPLIER’S CERTIFICATION
FINAL RELEASE OF LIEN
SALES TAX REPORT
NOTICE OF AWARD

Contractor: __________________ Date: __________________
Project: CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

Date of Bid Opening: ______________

You are notified that your bid dated ______________________ for the above Contract has been considered. You
are the apparent successful Bidder and the OWNER, New Hanover County Board of County Commissioners, expects to
award you a Contract for

(Indicate total Work, Alternates or sections of Work awarded)

The Contract Price of your contract is __________________________ Dollars ($ _______).

Six (6) copies of each of the following proposed Contract Documents (except Project Manual and Drawings) accompany this
Notice of Award.

Construction Contract Between Owner and Contractor
Performance Bond
Payment Bond
Certificate of Insurance and Endorsement - Worker’s Compensation
Certificate of Insurance and Endorsement - Liability
Certificate of Insurance and Endorsement - Contractual Liability
Notice of Award

You must comply with the following conditions precedent to the award of the contract within ten (10) days of the date of
this Notice of Award that is by ______________, 20__:

1. You must deliver to the OWNER six (6) fully executed counterparts of the Agreement.
2. You must deliver with the executed Agreement the payment and performance bonds in the form specified in the Bidding
   and Contract Documents.
3. You must provide in writing the correct name and address of the surety which is providing the payment and performance
   bonds AND the correct name and address of the surety's resident agent for service of process in North Carolina.
4. You must deliver with the executed Agreement completed certificates and endorsements of insurance in the form specified in
   the Bidding

Documents. Failure to comply with these conditions within the time specified will entitle OWNER to consider your Bid
abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited. Within ten (10) days after you comply
with these conditions, OWNER will return to you one fully signed counterpart of the agreement with the Contract documents
attached.

OWNER: ________________________________ BY: ________________________________
(Authorized Signature) (Authorized Signature)

__________________________ ____________________________
(Title) (Title)

__________________________________ ________________________________
(Acknowledge Receipt of Notice) (Authorized Signature)

Acct. No. ___________________________ Contractor

DATE: _____________________________

Copy to Engineer (Use Certified Mail, Return Receipt Requested)

END OF NOTICE OF AWARD
NOTICE TO PROCEED

Date: _________________________

Re:  Notice to Proceed on: CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

You are notified that the Contract Time under the above Contract will commence to run on ___ 20  . On that date you are to start performing the Work and your other obligations under the Contract Documents. Based on the Contract Time stated in the Agreement, we calculate that the date of Final Completion is ____________. Work at the site must be started by ____________, as indicated in the Contract Documents.

Enclosed is one set of Drawings and one bound copy of the Project Manual containing:

- Information to Bidders
- Proposal Schedule
- Bid Bond
- Executed Agreement
- Performance Bond
- Payment Bond
- Contract Forms
- Certificates of Insurance and Insurance Endorsements
- General Conditions
- Supplementary Conditions
- Notice of Award
- Specifications
- Addenda Numbers 1 through 4 original bid and Addendum Number 1 of rebid
- General Requirements

FOR OWNER: New Hanover County Board of County Commissioners

______________________________________ _________________________
(Authorized Signature)   (Authorized Signature)

______________________________________ _________________________
(Name and Title)    (Name and Title)

______________________________________ _________________________
(Acknowledge Receipt of Notice)  (Acknowledge Receipt of Notice)

END OF NOTICE TO PROCEED
CONTRACTOR’s VERIFICATION
OF THE EXISTING CONDITIONS AND THE ACCURACY OF DRAWINGS AND SPECIFICATIONS

(This form shall be submitted to the Engineer prior to the start of Construction)

STATE OF _______________________
COUNTY OF _______________________

________________________________________________________, being first duly sworn, deposes and certifies that:

1. Prior to the start of work on the site, Affiant has carefully studied and compared the Drawings and Specifications and checked and verified all pertinent figures shown thereon and all applicable field measurements;

2. Affiant hereby verifies that the Reports, Drawings and Specifications in the Contract Documents for the New Hanover County Secure Landfill, Construction of Cell 7 and Alternate for Cell 8A Partial Closure accurately represents the existing site conditions and do not contain any conflicts, errors, ambiguities, or discrepancies with the following itemized exceptions:

   Number of exceptions ___________ (if none, please indicate zero in the space provided).
   ________ additional sheets are attached.

________________________________________________________
Affiant

BY: ______________________________________

Sworn and subscribed before me this ______ day of ______________, 20__.

________________________________________________________
Notary Public

My Commission Expires: ________________

END OF CONTRACTOR VERIFICATION FORM
REQUEST FOR INFORMATION

<table>
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PROJECT DATA

| Name: CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A | Owner’s Bid Number: 18-0117 |
| Location: New Hanover County Secure Landfill | Date: |
| Owner: New Hanover County Board of Commissioners | Drawing Number: |
| Contractor: | Specification Section: |

QUESTION:

____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________

Prepared by:___________________________________  Date:_________________________________________
Received by:__________________________________  Date:_________________________________________

REPLY:

____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________

SCS Engineers  Project Number: ________________

Issued by: ________________  Date: _____________

END OF REQUEST FOR INFORMATION FORM
REQUEST FOR PROPOSAL

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PROJECT DATA

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<td>Date:</td>
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<td>Drawing Number:</td>
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<tr>
<td>Specification Section:</td>
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TO: (Contractor)

Please provide the undersigned a proposal for the following change in the work within ten (10) calendar days from the above date of this request. The written proposal must clearly delineate the scope of the proposed change in work by providing an itemized estimate of time and costs broke down by materials, labor (by trade), subcontracts, overhead costs and profit. Any amount claimed for subcontracts must be similarly supported in detail. If this proposal is accepted and approved by the Owner, a change order will be issued for changes in the work of the Contract in accordance with the Contract Documents.

Description of change in work:

____________________________________________________________________________________________________

Change Order Type: (Deletion) (Addition) (Revision) ( ) ( )

Initiated by:__________________________________________________________________________

Proposal must be received by:_____________________________________________________________ (30 days from date above)

Attachments (listing of attached documents that support description):
1. Contractor Request for Information No.: _______________________________________________
2. _____________________________________________________________________________________
3. _____________________________________________________________________________________
4. _____________________________________________________________________________________
5. _____________________________________________________________________________________

SCS Engineers          Project Number: ____________

Issued by: _________________ Date: _________________

New Hanover County Secure Landfill
Cells 7-13 Expansion Project

00830 - 6

Contract Forms

June 2017
You are hereby notified that the following work or materials does not conform to the requirements of the Contract Documents noted above. Non-complying work may be required to be removed and replaced at no cost to the Owner. It shall be your responsibility to determine the corrective action necessary, and to determine whether you wish to discontinue operations until additional investigation by the Owner or Engineer confirm or refute the initial findings.

Description of Non-Conforming Work or Materials:

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

Prepared by: _____________________________  Date: _____________________________

Received by: _____________________________  Date: _____________________________

Proposed Correction:

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

________________________________________________________________________________________

Failure to comply with directions to remedy deficiencies in this area will result in rejection of this portion of the work.

SCS Engineers

Reviewed by: _____________________________

Project Number: _____________________________

Date: _____________________________
FIELD ORDER

To: (Contractor)

You are hereby directed to execute promptly this Field Order that interprets the Contract Documents or orders minor changes in the work without change in contract price or contract time.

If CONTRACTOR determines that a change in Contract Price or Contract Time is required as a result of this FIELD ORDER, CONTRACTOR must make such a claim prior to starting the Work in accordance with Articles 11 and 12 of the General Conditions of the Contract Documents. If a Change Order is issued in accordance with Article 10 of the Contract Documents, this FIELD ORDER will be invalidated, otherwise, CONTRACTOR shall promptly proceed with the Work described in this FIELD ORDER pursuant to the applicable conditions of the Contract Documents.

Description of Change in work:

____________________________________________________________________________________________________________

____________________________________________________________________________________________________________

____________________________________________________________________________________________________________

____________________________________________________________________________________________________________

Attachments (listing of attached documents that support description):

1. Contractor Request for Information No.:

2.

3.

4.

5.

END OF FIELD ORDER

New Hanover County Secure Landfill
Cells 7-13 Expansion Project

00830 - 8

June 2017
To: (Contractor)

You are hereby directed to execute promptly this WORK CHANGE DIRECTIVE which orders an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in Article 4.2 or 4.3 of the General Conditions, or emergencies as provided in Article 6.24 of the General Conditions, without change in Contract Price or Contract Time.

If CONTRACTOR determines that a change in Contract Price or Contract Time is required as a result of this WORK CHANGE DIRECTIVE, CONTRACTOR must make such a claim prior to starting the Work in accordance with Articles 11 and 12 of the General Conditions of the Contract Documents. If a Change Order is issued in accordance with Article 10 of the Contract Documents, this WORK CHANGE DIRECTIVE will be invalidated, otherwise, CONTRACTOR shall promptly proceed with the Work described in this WORK CHANGE DIRECTIVE pursuant to the applicable conditions of the Contract Documents.

Description of Change in work:

____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________
____________________________________________________________________________________________________________

Attachments (listing of attached documents that support description):

1. Contractor Request for Information No.:________________________________________________________
2.__________________________________________________________________________________________
3.__________________________________________________________________________________________
4.__________________________________________________________________________________________
5.__________________________________________________________________________________________

New Hanover County, North Carolina

Issued by: _________________________                               Date: __________________________

END OF WORK CHANGE DIRECTIVE FORM
CHANGE ORDER FORM

PROJECT: CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

CHANGE ORDER NO.

DATE: ________________ CONTRACTOR: ________________

OWNER: County Board of County Commissioners AGREEMENT DATE ________________

The following changes are hereby made to the CONTRACT DOCUMENTS:

Original CONTRACT PRICE $____________________
Current CONTRACT PRICE ADJUSTED by previous CHANGE ORDER(S): $____________________
Net (Increase)(Decrease) Resulting from this CHANGE ORDER $____________________
The current CONTRACT PRICE including this $____________________

CHANGE ORDER
ORIGINAL CONTRACT TIME: ________________ Date ________________

Current CONTRACT TIME adjusted by previous CHANGE ORDERS Date ________________
Net (Increase)(Decrease) Resulting from this CHANGE ORDER Days ________________
Current CONTRACT TIME Including this CHANGE ORDER Date ________________

CHANGES ORDERED:

I. GENERAL

This change order is necessary to cover changes in the work to be performed under this Contract. The GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIFICATIONS and all parts of the Project Manual listed in Article 1, Definitions, of the GENERAL CONDITIONS apply to and govern all work under this change order.

Change Order No. ________________

Page 1 of 2
II. REQUIRED CHANGES

III. JUSTIFICATION

IV. PAYMENT

V. APPROVAL AND CHANGE AUTHORIZATION

Acknowledgments:

The aforementioned change, and work affected thereby, is subject to all provisions of the original Contract not specifically changed by this Change Order; and,

It is expressly understood and agreed that the approval of the Change Order shall have no effect on the original Contract other than matters expressly provided herein.

Change Order Request by: New Hanover County Secure Landfill

Change(s) Ordered by: __________________________, Director

RECOMMENDED BY: __________________________

ACCEPTED BY: __________________________

SCS Engineers

Engineer

Contractor

By: __________________________                  By: __________________________

Signature                  Date

Title: __________________________                  Title: __________________________

APPROVED BY: __________________________

ATTEST: BOARD OF COUNTY COMMISSIONERS of

NEW HANOVER COUNTY, NORTH CAROLINA

By: __________________________

Chairman

Clerk of the

Board of County Commissioners

of New Hanover County, North Carolina

This ______ day of _________, 20__.

As approved by the Board on_______________

END OF CHANGE ORDER FORM
WARRANTY OF TITLE

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

being first duly sworn, deposes and says as follows:

Affiant is ______________________ of ______________________

a ____________________ corporation which is named in the Construction Contract dated the ______
day of ______________, 20____, between said corporation as the CONTRACTOR and the New Hanover
County Board of County Commissioners as the OWNER, for the New Hanover County Secure Landfill,
CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A and Affiant is authorized to make
this Affidavit as, or in behalf of, the Contractor as named above.

Title to all work, materials and equipment covered by the attached Periodical Estimate for Payment
dated ________________, 20____ passes to the OWNER at the time of payment free and clear of all liens; and
all laborers, materialman and subcontractors have been paid for performing or furnishing the work, labor or
materials upon said Contract WORK covered by the aforesaid Periodical Estimate for Payment.

This statement under oath is given in compliance with Section _______ North Carolina Statutes.

________________________________________
AFFIANT

Sworn to and subscribed before me
this ___ day of __________, 20____.

Notary Public, State of North Carolina At Large
My Commission Expires:

END OF WARRANTY OF TITLE
CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER's Project No.________

ENGINEER's Project No. ____________________________

Project: CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A
CONTRACTOR _________________________________________________________________

Contract Date ___________________. This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof.

To: NEW HANOVER COUNTY BOARD OF COUNTY COMMISSIONERS,
OWNER

And To: __________________________________________________________

CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. When this Certificate applies to a specified part of the Work the items in the tentative list shall be completed or corrected by CONTRACTOR within ____________ (___) days of the above date of Substantial Completion. The date of Final Completion is the date upon which all guarantees and warranties begin, except as follows:

_________________________
Date of Substantial Completion

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities and insurance shall be as follows:

RESPONSIBILITIES:

OWNER:

______________________________________________________________________________

______________________________________________________________________________

CONTRACTOR:

______________________________________________________________________________

______________________________________________________________________________

Certificate of Substantial Completion
The following documents are attached to and made a part of this Certificate:

_____________________________________________________________

_____________________________________________________________

Executed by ENGINEER on ________________, 20__.

SCS Engineers
(Engineer)

By ________________________________________________

The CONTRACTOR accepts this Certificate of Substantial Completion on:

____________________, 20__.

(Contractor)

By

END OF SUBSTANTIAL COMPLETION FORM
SUBCONTRACTOR / VENDOR
FINAL RELEASE OF LIEN

KNOW ALL MEN BY THESE PRESENTS:

that the undersigned, for and in consideration of the payment of the sum of
_________________________________________________________ and ________/100
Dollars ($__________), paid by __________________________________________, receipt of
which is hereby acknowledged, hereby releases and quit claims to the New Hanover County
Board of County Commissioners, the OWNER, all lien rights, claims or demands of any kind
whatsoever, which the undersigned now has or might have against the Bonds for Work on
premises described as the New Hanover County Secure Landfill, CONSTRUCTION OF CELL 7
WITH ALTERNATE for CELL 8A on account of labor, equipment, and/or material furnished for
the construction of any improvements thereon. That all labor, equipment and materials used by
the undersigned in the erection of said improvements have been fully paid for.

Affiant hereby acknowledges that he/she is the __________________________ of
________________________________________, that he/she is duly authorized to make this
affidavit as, or on behalf of said corporation, and that the statements contained herein are true and
correct.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this _____ day of
_____________________, 20__.

____________________________________
Affiant

BY: ______________________________________

State of ______________________
County of_____________________

Sworn and subscribed before
me this _____ day of _____________, 20__.
Notary Public

My Commission Expires: ________________

END OF SUBCONTRACTOR / VENDOR RELEASE OF LIEN
# SHOP DRAWING SUBMITTAL

Owner: ______________________________

______________________________

______________________________

Contractor: ______________________________

______________________________

______________________________

SCS Engineers

Project No.: ______________________________

Specification No.: ______________________________

---

**New Hanover County**

**CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A**

### Project No.:

Owner’s Project No.: ______________________________

Contractor’s Project No.: ______________________________

Specification No.: ______________________________

---

### Action Codes

- **R**: REVIEWED, NO COMMENTS
- **RN**: REVIEWED, COMMENTS AS NOTED
- **RRR**: REJECTED, REVISE, AND RESUBMIT
- **NR**: NOT REVIEWED

### Engineer’s Action

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**ENGINEERS COMMENTS:**

_______________________________________________________________________________________________________________________

_______________________________________________________________________________________________________________________

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**Distribution**

- Contractor: ___ Copies
- Owner: ___ Copies
- PBS&J Interservice: ___ Copies
- PBS&J Field: ___ Copies

---

**Discipline Review:**

Reviewed By: ______________________________

Date: ______________________________

---

**Contractor:**

Submittal No.: ______________________________

Resubmittal: Yes  No

Contractor’s Submittal No.: ______________________________

---

**SUBMITTED BY**

Contractor: ______________________________

DATE: ______________________________

---

**Project Manager Date**

---

**New Hanover County Secure Landfill**

Cells 7-13 Expansion Project

**Contract Forms**

00830 - 17

**June 2017**
APPLICATION FOR PAYMENT NO. __________

PROJECT NO. __________

PROJECT NAME: CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A
OWNER: ______________________________________________________

CONTRACTOR: ________________________________________________

1. Original Contract Amount $___________
2. Value of original contract work performed to date: $___________
3. Extra work completed to date: $___________
4. Materials accepted and stored at site: $___________
5. Gross value to date: $___________
6. Ten percent retained: (-) $___________
7. Net amount due to date: $___________
8. Less previous net amount paid: (-) $___________
9. Balance due this payment: $___________

Note: This Application must be accompanied with the Certification of Contractor Form.

RECOMMENDED FOR PAYMENT

_______________________________
SCS Engineers

By: ____________________________
CERTIFICATION OF CONTRACTOR

According to the best of my knowledge and belief, I certify that all items and amounts shown on Application for Payment No. ____ are correct, that all work has been performed and/or materials supplied in full accordance with the terms and conditions of this Contract, dated ________________, 20____, between

__________________________________________ (Owner)

and _________________________________________ (Contractor)

I further certify that all just and lawful bills against the undersigned and his subcontractors and suppliers for labor, material and equipment employed in the performance of this Contract have been paid in full accordance with their terms and conditions; that all taxes imposed by North Carolina Statutes (Sales and Use Tax Act), as amended, have been paid and discharged; and that there are no Vendor’s, Mechanic’s or other Liens or rights to liens or conditional sales contracts which should be satisfied or discharged before such payment is made.

Date: ___________________ Contractor:

STATE OF NORTH CAROLINA)  ss
COUNTY OF NEW HANOVER)

Personally appeared before me this ____ day of __________, 20____,

__________________________________________ known (or made known) to me to be the

(Owner) (Partner) (Corporate Officer - Give Title)

of ______________________________________ Contractor(s), who subscribed and swore to the above instrument in my presence.

Notary Public - (Type Name)

My Commission Expires:

______________________, 20____.

The Contractor shall execute this Certificate and attach it to each Application For Payment.

END OF FORM
SUBCONTRACTOR'S/SUPPLIER'S CERTIFICATION

According to the best of my knowledge and belief, I certify that payment for all billings to ____________________________ (Contractor) for work under the Contract entitled:

CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A

is current and the Contractor has been making satisfactory payment for services, equipment, supplies and materials.

Date: __________  Subcontractor and/or Supplier ______________________________

Signed

____________________________________________________________________

(Type Name)

____________________________________________________________________

(Company)

____________________________________________________________________

(Address)

____________________________________________________________________

(Telephone No.)

Subcontractors and/or Suppliers to complete, and Contractor to return with each Application For Payment.

END OF FORM
FINAL RELEASE OF LIEN

KNOW ALL MEN BY THESE PRESENTS, that

for and in consideration of ___________________________ Dollars ($ __________) paid to
_________________________ by the ___________________________, North Carolina, receipt of which is hereby acknowledged, do(es) hereby release and quitclaim to New Hanover County, North Carolina, the Owner, its successors or assigns, all liens, lien rights, claims or demands of any kind whatsoever which ________________ now has (have) or might have against the property, building, and/or improvements, on account of labor performed, material furnished, and/or for any incidental expense for the construction of:

New Hanover County Secure Landfill

CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A, thereon or in otherwise improving said property situated as above described.

IN WITNESS WHEREOF _________________ have (has) hereunto set _____________ hand and seal this ___ day of __________, 20__, A.D.

WITNESS:

_______________________________ (Seal)

SWORN AND SUBSCRIBED TO BEFORE ME THIS ___ day of __________, 20__, A.D.

Notary Public
State of North Carolina-at-Large

My Commission Expires: _________________, 20__.
AFFIDAVIT

STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

Before me, the undersigned authority, authorized to administer oaths and take acknowledgments, personally appeared ____________________________, who, after being first duly sworn, upon oath deposes and says that all lienors contracting directly with, or directly employed by (him, them, it) and that all taxes imposed by North Carolina Statutes have been paid and discharged, and that all bills, wages, fees, claims and other charges incurred by ____________________________ in connection with the construction of:

NEW HANOVER COUNTY SECURE LANDFILL
CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A
have been paid in full.

SIGNED: ____________________________

By: ____________________________

WITNESSES:

_______________________________

_______________________________

SWORN AND SUBSCRIBED TO BEFORE ME THIS ____ day of ____________, 20__ A.D.

State of North Carolina-at-Large

My Commission Expires: ________________, 20__

END OF FORM
SALES TAX REPORT

COMPANY NAME ___________________________________  PROJECT CONSTRUCTION OF CELL 7 WITH ALTERNATE for CELL 8A
AND ADDRESS _____________________________________ FOR PERIOD ____________ THRU ____________

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______________________________ being duly sworn, certifies that the foregoing statement of sales tax paid in the connection with the referenced contract is true to the best of his or her knowledge and belief.

____________________________________
Title

Sworn to before me this ____________ day of _______________, 20 .

My commission expires ______________________________, 20 .

END OF FORM
DIVISION 1

GENERAL REQUIREMENTS
PART 1 - GENERAL

1.01 SCOPE AND INTENT

The project generally consists of two potential components. The Base Bid project is the construction of the Cell 7 disposal area. The County has provided for the clearing and grubbing of the areas of Cell 7, 8A, 9, and 10A. This zone will be the area of cell development and soil borrow. Cell 7 work consists of the initial survey that will serve as the basis of payment for calculation of the construction effort. The area to be surveyed will include sufficient coverage to include the roads and cells including the berms. It will also include limited clearing and grubbing; placement of compacted fill with rough and fine grading; placement of the geosynthetic clay liner; double synthetic liner system with an additional liner layer below the sump area; triplanar geocomposite; biplanar geocomposite; rain tarp; 24-inches protective cover soil; leachate collection and removal system; installation of the leachate pumps; installation of pumps for removal of stormwater; installation of the control panel for the pumps; installing a forcemain for the leachate from the southeast border of Cell 7 to the existing manhole at Cell 5; training on equipment; berms with toe drains; sodding; preparation and placement of storm drainage systems including swales, drop inlets, and piping; roadway access extension; and other incidentals necessary to complete the work in accordance with the Contract Documents. The entry road conditions along part of the north side of Cell 7 will require clearing of vegetation on the slopes of the borrow pit in order to bring the road up to grade. The contractor will work with the County and the CQA personnel on site during this process.

The second component is an add alternate to the Cell 7 construction that will provide for the construction of Cell 8A. If this alternate is added to the base bid, the effort will apply the same work and materials to provide an increase in size of Cell 7. The existing conditions survey will include Cell 8A.

Note that the electrical drawings are included to show the conditions of installation of the power source and controls at the Cell 7 location. The County will arrange for the service from Duke Energy to be extended to the new panel location. The contractor is to provide a meter base and disconnect for the new location, placement of the control systems, and to provide for the pump manufacturer to install and test the pumps. The contractor will coordinate with the County to connect the power to the meter base through the power company. Control panel(s) and disconnect will be provided by the contractor and the power supply extended to the wetwell system. Control wiring and meter connection will be made to the electrical panel in accordance with the drawings.
The Contractor will be responsible for providing any needed construction support and associated health and safety requirements for excavation, connecting the new forcemain to the existing manhole, or any other efforts associated with providing contracted services on an active landfill. The Contractor is required to provide a plan of the proposed approach to providing for the safety features.

A. Work Included:

1. The Contractor shall furnish all supervision, labor, materials, power, light, heat, fuel, water, tools, appliances, equipment, supplies, and means of construction necessary for proper performance and completion of the work. Contractor shall obtain and pay for all required permits. Contractor shall perform and complete the work in the manner best estimated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Owner, and in strict accordance with the Contract Documents. The Contractor shall clean up the work and maintain it during and after construction, until accepted, and shall do all work and pay all costs incidental thereto. Contractor shall repair or restore all structures and property that may be damaged or disturbed during performance of the work.

2. The cost of incidental work described in these General Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the work and shall be included in the prices for the various Contract Items. No additional payment will be made therefor.

3. The Contractor shall provide and maintain such modern materials, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials and equipment, prior acceptance of the Engineer notwithstanding.

B. Public Utility Installations and Structures:

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water or other public or private property which may be affected by the work shall be deemed included hereunder.
2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. This data is not guaranteed as to their completeness or accuracy and it is the responsibility of the Contractor to make investigations to fully understand the character, condition and extent of all such installations and structures as may be encountered and as may affect the construction operations.

3. The Contractor shall protect all public utility installations and structures from damage during the Work. Access across any buried public utility installation or structure shall be made only in such locations and by means accepted by the Engineer. The Contractor shall so arrange his operations as to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at no additional expense to Owner or Engineer. All existing public utilities damaged by the Contractor which are shown on the Drawings or have been located in the field by the utility shall be repaired by the Contractor, at his expense, as directed by the Engineer. No separate payment shall be made for such protection or repairs to public utility installations or structures.

4. Public utility installations or structures owned or controlled by the Owner or other governmental body which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as a part of the general cost of doing the Work and shall be included in the prices bid for the various Contract items. No separate payment shall be made therefor.

5. Where public utility installations of structures owned or controlled by the Owner or other governmental body are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement or rebuilding is necessary to complete the Work under this Contract, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such work is accomplished by the Contractor, it will be paid for as extra work as provided in the Agreement.

6. The Contractor shall, at all times in performance of the Work, employ accepted methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public
utility services, and shall cooperate fully with the owners thereof to that end.

7. The Contractor shall give written notice to Owner, other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least forty-eight (48) hours in advance of breaking ground in any area or on any unit of the Work.

8. The maintenance, repair, relocation or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the owners of such utilities.

9. Utilities that may be encountered, can be contacted as follows:

Duke Energy
On-site County Staff

10. The Contractor shall make provisions to avoid impacting existing facilities operation or maintenance activities. If an impact is anticipated, the Contractor shall propose a means to maintain existing activities, subject to approval by the Owner. The Owner will not be responsible for any costs associated with such proposed modification.

1.02 DRAWINGS AND PROJECT MANUAL

A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions, and large scale drawings in preference to small scale drawings.

B. Copies Furnished to Contractor:

1. After the Contract has been executed, the Contractor will be furnished one set of plans (24 inches by 36 inches) and one (1) copy of the Project Manual (Contract Requirements and Specifications) and all addenda.

2. The Contractor shall furnish each of the subcontractors, manufacturers, and material suppliers such copies of the Contract Documents as may be required for their work. All copies of the Contract Documents shall be printed from the reproducible sets furnished to the Contractor. All costs of reproduction and printing shall be borne by the Contractor.

C. Supplementary Drawings:
1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer and the Contractor will be furnished one (1) CD of topo, five (5) sets of plans and one (1) copy of the Project Manual (Contract Requirements and Specifications) and all addenda.

2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of work, credit to the Owner or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

D. Contractor to Check Drawings and Data:

1. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, schedules, Specifications or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction or improper operation resulting therefrom nor from rectifying such conditions at no additional expense to Owner or Engineer. Contractor will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Engineer, should such errors or omissions be discovered.

2. All schedules are given for the convenience of the Owner and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract and additional work claimed by Contractor.

E. Specifications: The Technical Specifications consist of three parts: General, Products and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these by detailed requirements for the work and shall always govern whenever there appears to be a conflict.

F. Intent:

1. All work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either
the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. The names of proposed manufacturers, material suppliers, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Engineer for acceptance, prior to construction, to afford proper investigation and checking. No manufacturer will be accepted for any materials to be furnished under this Contract unless he shall be of good reputation and have a plant of ample capacity. Contractor shall, upon the request of the Engineer, be required to submit evidence that he has manufactured a similar product to the one specified and that it has been previously used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

2. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request, in writing to the Engineer, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract and will not impose any liability on the Owner or Engineer.

3. Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery:

1. The Contractor shall deliver materials to the site in ample quantities to insure the most speedy and uninterrupted progress of the work so as to complete the work within the scheduled time. However, the Contractor shall not store materials on-site for more than thirty (30) days before
installation. This will not supersede more stringent requirements noted in Division 2.

2. The Contractor shall also coordinate deliveries in order to avoid delay in, or impede, the progress of the work of any related Contractor.

3. All materials and equipment shall be properly stored on site in accordance with these specifications and the manufacturer's recommendations.

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind or size of equipment, one complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain or repair the equipment. Such tools and appliances shall be furnished in accepted painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.

2. Spare parts shall be furnished as specified in the specifications.

3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight and principal rate data.

D. Service of Manufacturer's Engineer:

1. The Contract prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test and place in operation, the equipment in conformity with the Contract Documents.

2. Prior to the equipment being placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition, and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

**1.04 INSPECTION AND TESTING**

A. General:

1. Inspection and testing of materials will be provided by the Contractor unless otherwise specified.
2. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Two (2) originally executed and five copies of the reports shall be submitted and authoritative certification thereof shall be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.

3. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract Documents, the Contractor will be notified thereof and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the work and replace it with acceptable material, without cost to the Owner or Engineer.

4. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

5. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner executes final acceptance of the work.

B. Costs:

1. The cost of preliminary shop and field tests of equipment and certain other tests specifically called for in the Contract Documents shall be borne by the Contractor and such costs shall be deemed to be included in the Contract price.

2. Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Owner for compliance. The Contractor is responsible for providing sufficient information to allow Engineer to determine that the item of material or equipment proposed is equivalent to that specifically named and an acceptable substitute therefor. If in the sole discretion of the Engineer, tests of the proposed substitute items are necessary for Engineer’s review, the substitute items will be tested by the Contractor at no additional cost to the Owner.

C. Inspection of Materials:

1. The Contractor shall give notice in writing to the Engineer, sufficiently in advance of his intention to commence the manufacture or preparation of
materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Engineer will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials or Engineer will notify the Contractor that the inspection will be made at a point other than the point of manufacture.

2. The Contractor must comply with these provisions before shipping any material. Such inspection shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

D. Certificate of Manufacture:

1. The Contractor shall furnish to Engineer authoritative evidence in the form of Certificate of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Contract Documents.

2. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product to be provided by the manufacturer. Two (2) original and five (5) copies are to be provided to the Engineer.

E. Shop Tests:

1. Testing for pressure, duty, capacity, rating, efficiency, performance, function or special requirements which are specified shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.

2. No such equipment or materials shall be shipped to the Work site until the Engineer notifies the Contractor, in writing, that the results of such tests are acceptable.

3. Two (2) signed original and five (5) copies of the manufacturer's actual test data and interpreted results thereof, accompanied by two (2) signed original and five (5) copies of a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be forwarded to the Engineer for acceptance.

4. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.
F. Final Field Tests:

1. Upon completion of the work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance tests as specified or required to provide compliance with the Contract Documents. Two (2) original signature and five (5) copies of Letter of Compliance and test results shall be provided by Contractor.

2. The Contractor shall furnish labor, fuel, energy, water and all other materials, equipment and instruments necessary for all acceptance tests, at no additional cost to the Owner or Engineer. The Contractor shall assist in the final field tests.

G. Final Inspection: During such final inspections, the Work shall be clean and functional. In no case will the final estimate be prepared until the Contractor has complied with all requirements set forth and the Engineer and Owner have made their final inspection of the entire Work and are satisfied that the entire Work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

1.05 TEMPORARY STRUCTURES

A. Temporary Fences: If, during the course of the Work, it is necessary to remove or disturb any fence or part thereof, the Contractor shall provide a suitable temporary fence at no additional cost to Owner or Engineer.

B. Responsibility for Temporary Structures: In executing the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance or operation and will indemnify and hold harmless the Owner and Engineer from all claims, suits or actions and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.06 ACCIDENT PREVENTION

A. Precautions shall be exercised at all times for the protection of person and property. The safety provisions of applicable laws, building and construction codes shall be observed.

B. The Contractor shall comply with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596), and under Hours and Safety Standards Act Section 107 of the contract Work. Hours and Safety Standards Act (PL 91-54), except where state and local safety standards exceed the federal requirements and except where state safety standards have been approved by the Secretary of Labor.
in accordance with provisions of the Occupational Safety and Health Act, shall be
complied with. Updates of the referenced regulations also shall apply.

C. First Aid: The Contractor shall keep upon the site, at each location where work is in progress, a completely equipped first aid kit and shall provide ready access thereto at all times when people are employed on the Work.

1.07 LINES AND GRADES

A. Grade:

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as provided by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.

2. The Owner will provide available information regarding bench marks and base line controlling points on the drawings. Reference marks for lines and grades as the work progresses will be located by Contractor to cause as little inconvenience to the prosecution of the Work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. The Contractor shall remove any obstructions placed contrary to this provision.

B. Surveys:

1. The Contractor shall furnish and maintain, at no additional expense to Owner or Engineer, stakes, temporary benchmarks and other such materials.

2. The Contractor shall check such reference marks by such means as he may deemed necessary and, before using them, shall provide written notification to Engineer's regarding presumed inaccuracies.

3. The Contractor shall, at no additional expense to Owner or Engineer, establish all working or construction lines and grades as required from the reference marks made available by the Owner, and shall be solely responsible for the accuracy thereof. Field engineering shall be in accordance with Section 01050.

C. Safeguarding Marks:

1. The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks made or established on the Work, bear the cost of reestablishing them if disturbed, and bear the entire expense of rectifying
work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes and marks.

2. The Contractor shall safeguard all existing and known property corners, monuments and marks adjacent to but not related to the Work and, if required, shall bear the cost of reestablishing them if disturbed or destroyed.

1.08 ADJACENT STRUCTURES AND LANDSCAPING

A. Responsibility:

1. The Contractor shall also be entirely responsible and liable for all damage or injury as a result of his operations to all other adjacent public and private property, structures of any kind and appurtenances thereto met with during the progress of the Work.

2. The cost of protection, replacement in their original locations and conditions or payment of damages for injuries to such adjacent public and private property and structures affected by the work, whether or not shown on the Drawings, and the removal, relocation and reconstruction of such items called for on the Drawings or specified shall be included in the various Contract Items and no separate payments will be made therefore.

3. Contractor is expressly advised that the protection of buildings, structures, tanks, pipelines, etc. and related work adjacent and in the vicinity of his operations, wherever they may be, is solely his responsibility.

4. Conditional inspection of buildings or structures in the immediate vicinity of the project which may reasonably be expected to be affected by the Work shall be performed by and be the responsibility of the Contractor.

5. Contractor shall, before starting operations, make an examination of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by open excavation and construction. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the Owner and Engineer. This does not preclude conforming to the requirements of the insurance underwriters. Copies of surveys, photographs, reports, etc., shall be provided to the Owner.

6. Prior to the beginning of any excavations the Contractor shall advise the Owner of all structures on which he intends to perform work or which performance of the Work will affect.
B. Protection of Trees: All trees and shrubs shall be adequately protected by the Contractor with boxes and in accordance with ordinances governing the protection of trees. Excavated materials shall be placed so as not to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by Contractor with new stock of similar size and age, at its proper season and at the sole expense of the Contractor.

C. Lawn Areas: Lawn areas shall be left in as good condition as before the starting of the Work. Where sod is to be removed, it shall be carefully removed, and later replaced, or the area where sod has been removed shall be restored with new sod.

D. Restoration of Fences:
   1. Any fence, or part thereof, that is damaged or removed during the course of the Work shall be replaced or repaired by the Contractor and shall be left in as good a condition as before the starting of the Work.

   2. The manner in which the fence is repaired or replaced and the materials used in such work shall be subject to the acceptance of the Owner and Engineer.

   3. The cost of all labor, materials, equipment, and work for the replacement or repair of any fence shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefor, as part of the overhead cost of the work, and no additional payment will be made therefor.

1.09 PROTECTION OF WORK AND PUBLIC

A. Barriers and Lights:
   1. During the prosecution of the work, the Contractor shall put up and maintain at all times such barriers and lights as will effectually prevent accidents.

   2. The Contractor shall provide suitable barricades, red lights, "danger" or "caution" or "street closed" signs and flagmen at all places where the Work causes obstructions to the normal traffic or constitutes in any way a hazard to the public.

B. Noise:
   1. The Contractor shall eliminate noise to as great an extent as practicable at all times. Air compressing equipment shall be equipped with silencers and the exhaust of all gasoline motors or other power equipment shall be
provided with mufflers. The Contractor shall construct sound barriers as necessary to eliminate noise.

2. In the vicinity of hospitals and schools, special care shall be used to avoid noise or other nuisances. The Contractor shall strictly observe all local regulations and ordinances covering noise control.

3. Except in the event of an emergency, no work shall be done between the hours of 5:30 p.m. and 7:30 a.m., Monday through Saturday or on Sundays or New Hanover County observed Holidays. If the proper and efficient prosecution of the Work requires operations during the night, the written permission of the Owner shall be obtained before starting such items of the Work.

C. Access to Public Services: Neither the materials excavated nor the materials or equipment used in the construction of the Work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.

D. Dust Prevention: The Contractor shall prevent dust nuisance from his operations or from traffic by keeping the roads and/or construction areas dampened with water at all times.

1.10 CUTTING AND PATCHING

A. The Contractor shall do all cutting, fitting or patching of the Work that may be required to make the several parts thereof join and coordinate in a manner satisfactory to the Engineer and in accordance with the Drawings and Specifications.

B. The work must be done by competent workmen skilled in the trade required by the restoration.

1.11 CLEANING

A. During Construction:

1. During construction, the Contractor shall, at all times, keep the site of the Work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove the same from any portion of the site if, in the opinion of the Owner or Engineer, such material, debris, or rubbish constitutes a nuisance or is objectionable.

2. The Contractor shall remove from the site all of his surplus materials and temporary structures when no further need therefore develops. Contractor shall be responsible and liable for all spillage and incur all associated costs including, but not limited to, costs related to repair and maintenance.
resulting from damages thereof, and fines that may be levied as a result of citations given by State or local regulatory agencies.

B. Final Cleaning:

1. At the conclusion of the Work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly removed, and shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances to a facility permitted to manage these materials.

2. The Contractor shall thoroughly clean all equipment and materials installed and shall deliver such materials and equipment undamaged in a bright, clean, polished and new operating condition.

1.12 MISCELLANEOUS

A. Protection Against Siltation and Bank Erosion:

1. The Contractor shall arrange his operations and construct erosion control devices to minimize siltation and bank erosion on construction sites and on existing or proposed water course and drainage channels.

2. The Contractor, at no additional expense to Owner or Engineer, shall remove any siltation deposits and correct any erosion problems as directed by the Engineer which results from Contractor’s construction operations.

B. Protection of Wetland Areas:

1. The Contractor shall properly dispose of all surplus material, including soil, in accordance with local, state and federal regulations and with Owner’s instruction.

2. Under no circumstances shall surplus material be disposed of in wetland areas as defined by the Army Corps of Engineers or the North Carolina Department of Environment and Natural Resources.

C. Existing Facilities: The work shall be so conducted to maintain existing traffic lanes in operation.

D. Use of Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfection, polymer, reactant, or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions. Contractor shall obtain written approval from Owner prior to use of chemicals.
E. Cooperation With Other Contractors and Forces:

1. During progress of work under this Contract, it may be necessary for other contractors and persons employed by the Owner to work in or about the project.

2. The Owner reserves the right to put such other contractors to work and to afford such access to the work area to be performed at times as the Owner deems proper.

3. The Contractor shall not impede or interfere with the work of such other contractors engaged in or about the Work and shall so arrange and conduct the work that such other contractors may complete their work at the earliest date possible.

F. Construction shall be conducted and shall result in construction of the improvements of this project in full accordance with the conditions of the permits granted for the project.

1.13 OWNER'S REPRESENTATIVES

A. The County will appoint the Resident Project Representative (RPR) and Project Manager (PM) as the Owner's representative as defined in the General Conditions.

1.14 PRE-EXISTING CONDITIONS

A. The County conducted an aerial survey in the immediate areas of the construction. The County does not guarantee or warrant the accuracy of the survey. The Contractor will conduct a pre-existing conditions survey of each of the areas that are part of the construction area. The survey shall establish the state of the property before construction as a basis for any claims of damage that may occur and an electronic version in AutoCAD will be provided to the County.

B. This survey shall include comprehensive photography and video taping of the site, grounds, and structures; spot elevations of grades and tops of walls; side slopes; existing spillways; perimeter swales and roads; and shall make note of any identified previously damaged areas. Photos and videotape shall be submitted to Engineer/Owner for review and acceptance prior to start of work.

PART 2 PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01010

SUMMARY OF PROJECT

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

The project generally consists of construction of CELL 7 WITH ALTERNATE for CELL 8A disposal area. The base bid is for the construction of Cell 7. The Alternate for Cell 8A is an add alternate to include the construction of Cell 7 and 8A as a single unit. The County has provided for the clearing and grubbing of the area of the project. Construction of the peripheral road adjacent to Cell 7 will require that the contractor conduct additional clearing and grubbing the slope within the project area along the bank of the north property borrow pit. To build the road additional soil will need to be placed that will include areas under the surface of the water in the borrow area. The first activity will be conducting the topographic survey of the project area that will be part of the construction of the disposal units (7 and 8A). Payment for parts of the bid items will be based on the compacted fill in place. Surveys provided by the contractor will be required for this purpose. The initial survey and any survey for measurements for pay purposes are to be conducted by a North Carolina registered surveyor and will be based on the difference in elevation as computed by AutoCAD between the initial survey and final subgrade survey. A depth check will be conducted to confirm the depth of soil over the liner and a field survey of the final grades will also be conducted on the top of the protective cover over the liner system. Minimum depths are required. Gravel roadway improvements will be conducted within the project area. Stormwater structures, piping, and swale conveyances will be constructed.

The installation of a leachate collection/pump system will be constructed to address leachate management. The pumps will deliver the leachate to the existing treatment system via a double contained forcemain that will connect to an existing manhole from which the leachate will flow to the existing site master pump station. The Contractor is to determine the appropriate connection method to connect the forcemain to the manhole. A small pump for the secondary containment area and larger pumps for pumping the leachate to the manhole will be required. A rain tarp will be installed to provide for collection of stormwater before it becomes leachate. A high flow pump for removing stormwater will be required to discharge the water to a percolation basin. The liner system will consist of two layers of HDPE with a third layer to be placed under the sump. An additional liner consisting of a geosynthetic clay will be installed under the HDPE liners. Geocomposites will be placed between the HDPE liners and on top of the primary liner to allow for collection of the liquids on top of or between the liners.

WORK SEQUENCE

A. The work is to be constructed in stages to accommodate Owner’s occupancy requirements during the construction period. Coordinate construction schedule and operations with Owner. It is desired that the project be initiated at issuance of Notice to Proceed. Time is of the essence.
B. Sequencing of the work shall be in one stage with the construction of Cell 7 and if Cell 8A is included in the project, both cells will be constructed as a single cell. Installation of the primary and secondary leachate pumps including electrical connections, and appurtenances will be part of the final work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION
SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

A. Payments to the Contractor shall be made on the basis of the Bid Items as full and complete payment for furnishing all material, labor, tools and equipment, and for performing all operations necessary to complete the Work included in the Contract Documents. Quantities provided in the bid documents are estimates of the units needed to complete the work but are not warranted by the Engineer to be absolutely exact. The existing grades shown on the drawings were provided by an aerial topographic survey and are included as a reference only. The contractor is to provide an initial survey to demonstrate the existing conditions prior to conducting any grading. Any clearing and grubbing needed will conducted prior to conducting the existing condition survey. The quantities shown on the bid form are estimates to provide for an equal basis for evaluating the bids. The actual payment quantities will be based on the unit prices where defined in the bid tabulation or percent complete for lump sum bid items. The final survey will cover all areas disturbed by the contractor. Additionally, the protective cover in the cell will be calculated based on the in-place soil between the liner survey and the final grades of the top of the protective cover. The survey descriptions are in the appropriate measurement and payment section. Calculations will be based on AutoCAD survey data provided by the Contractor to the Engineer.

B. The prices stated in the Bid Form include all costs and expenses for taxes, labor, equipment, material, commissions, transportation charges and expenses, patent fees and royalties, labor for handling material during inspection, together with any and all other costs and expenses for performing and completing the Work, as shown on the Plans and specified herein. The basis of payment for Bid Items at the price shown in the Bid Form shall be in accordance with its description of the item in this section and as related to the Work specified and shown on the Drawings. Unit prices where used will be applied to actual quantities furnished and installed in conformance with the Contract Documents.

C. The Contractor’s attention is called to the fact that the quotations for the various items of Work are intended to establish a total price for completing the Work in its entirety. The cost of Work for which there is not a separate Bid Item shall be included in a related Bid Item, or shall be distributed over all Bid Items, such that the bid for the project reflects the total price for completing the Work in its entirety.

D. The County will have the right to issue one or more Change Orders prior to Final Payment, which will reconcile actual quantities furnished and accepted with the
estimated quantities found in the Bid Form. Force Account work performed may be included in the Change Orders.

E. Payment of any Bid Item, in part or in full, prior to Final Payment, shall not be regarded as acceptance of that item.

F. The Contractor’s attention is called to the fact that if shown, the estimated quantities appearing in the Bid Form consists of the Engineer’s opinion of what will be required to complete the Work as designed. Neither the County nor the Engineer guarantees the accuracy or exactness of the figures. The actual quantities will be determined during and after construction, based upon the measurements herein described. The estimated quantities are not a guarantee of the magnitude of Work. The County reserves the right to authorize additional amounts of any or all of the Bid Items, and to reduce or totally eliminate any of the Bid Items, without affecting any other Bid Items.

G. All existing grades shown on the drawings are approximate and the Contractor is responsible to field verify all grades based on a detailed survey by a registered land surveyor licensed in the State of North Carolina.

H. The Contractor shall immediately report overpayment on any item.

I. The County will have the right to deduct for overpayment of any item, when discovery of overpayment is made, and to adjust the amounts due the Contractor accordingly.

J. The County will have the right to require the Contractor to excavate and expose any item which was covered after installation for the purpose of measuring, testing, or inspecting the item; and the Contractor shall comply with such request. No separate or additional payment will be made for such extra work. The Contractor shall, when accepted or directed to by the County, restore and repair the Work in conformance to the Contract Documents.

K. Work performed beyond the Contract requirements shall be approved and accepted before payment may be made. Mere knowledge by the County or the Engineer that the Contractor has performed a task shall not constitute acceptance of the task for the purpose of payment, and the County will not be under obligation to pay for the task.

L. The County reserves the right to request of the Contractor a breakdown of any of the Lump Sum Bid Items, which the Contractor shall promptly provide. The breakdown shall consist of labor, equipment, and the cost of material for the Bid Item or the various components included within the Bid Item.
M. Lump Sum items have been established for some portions of the work. The term "Lump Sum" shall mean complete payment for the unit of work described. Where the unit measurement is described as "Lump Sum", the unit shall include all necessary appurtenances and incidentals required to complete the unit of work. Measurement of the lump sum work will be estimated by the values in the Schedule of Values as applied to the completed portion of work for purposes of monthly payment estimates.

N. Unit Price Items may be applied for specific items as noted above.

PART 2 - MEASUREMENTS

A. Progress payments for Lump Sum Bid Items will be considered on a percent completed basis. The Schedule of Values prepared as per the General Conditions will be used as the basis of the percent complete. The Contractor shall estimate the value of the work performed, subject to the review and acceptance by the Engineer.

B. The Contractor’s surveyor will obtain the field data to be used in calculating the earthwork volumes. The Contractor shall submit quantities for payment, with calculations, for the County’s review and acceptance, in accordance with the Contract Documents.

C. The Engineer and County will review these calculations prior to making payments. The Contractor shall give the Engineer and County access to all field data, calculations, and computations. In the event of discrepancies or the need for additional field data to confirm quantities, the Contractor shall be responsible for the additional surveying cost.

D. Prior to submitting his first requisition for payment, the Contractor shall secure the Engineer’s and County’s concurrence on the methods and procedures for making field measurements and the manner in which calculations will be performed in preparation of progress and final payment estimates.

E. Quantity estimates, field measurements, certifications, and related backup information that are submitted in support of payment request will be considered by the County as having been prepared by the Contractor, even when prepared by or submitted on behalf of the Contractor by others.

F. Earthwork quantities that result from unauthorized over-excavations, stripping of borrow pit, unauthorized overfilling, or from under-filling will not be considered for payment. These operations include excess volumes removed from on-site excavations, additional cover or clean fill material required to fill excess cuts, or to fill embankments that do not meet the base grade requirements.
G. The value of furnished materials, for which partial progress or full payment is made during the course of the Work that remain unused at the closing of the Contract, shall be deducted from the amounts due the Contractor in the Final Payment.

H. This bid is broken into two parts. The Base Bid includes Cell 7 construction as demonstrated in the drawings. An add-alternate will add Cell 8A to the bid. If accepted by the County and included in the project the contract amount will be inclusive of construction of Cells 7 and 8A.

PART 3 - PAYMENT ITEMS (BY BID ITEM NO.)

A. GENERAL (Applies to Cell 7 Construction)

Mobilization and demobilization of equipment, personnel, and work forces to the work site; readying to commence construction by providing field offices, electric, telephone, water, and sanitary utilities; by obtaining permits, licenses, insurance, and bonds; and by submitting to the County necessary information such as, but not limited to, schedules, safety plan, progress photographs, work plans, and shop drawings, will be considered for payment. Survey efforts are to be included under this section. Under this item, the Contractor shall be responsible for site preparation and filling the area for field offices and for parking.

The Survey line item will not be computed in the 5% limit and will include the following surveys:

- Initial site survey to include the borrow areas adjacent to the cell (approximately 40 acres).
- Top of subgrade survey on a 50 foot grid and at all break points within the construction area. This survey will be the basis of payment.
- Top of liner system to define limits of the liner and elevations as noted above.
- Final site survey for the same area as in the initial site survey to serve as the site “as-built.” A separate component of the final survey will be the top of protective layer soil elevations for the final cover over the liner system, berms, and roadways. This survey will be used to compute the volume of soils in the protective cover. Elevations surveyed should be at the same location as the top of subgrade and top of liner locations for a direct comparison of the depths of each level.

Payment will be made in the Total Amount Bid under this item, said item not to exceed five (5) percent of the Total Bid Amount for the project, as reflected on
the Bid Form, and no additional compensation exceeding the Total Amount Bid shall be made under this item except for the survey line item for any reason.

Payment for Bid Item 1 can be requested on the first payment request based on the bid amount, or the documented actual payment amount, whichever is less. Payment for mobilization shall be full compensation for all materials, labor, equipment, tools, excavation, advance work in preparation, and physical improvements to the site necessary for complete mobilization.

B. SITE WORK FOR CELL 7

Work includes any additional clearing and grubbing not already completed by the County. The work effort should be reviewed with the site construction observer and approved for commencement on that task. Payment will be made to the nearest 0.10 of an acre. The cut/fill items are included should soils not meeting the compaction standards need to be removed and replaced. Subgrade Preparation will include placement and compaction of soils to the elevations noted on the drawings for the top of subgrade including berms and will be paid per square yard. Topsoil is to be placed on the outside slopes of the berms on the north and east sides of the berms, in the swales and perimeter road side slopes. The seed and mulch if any will be as per directed by the County in the area of the project. Work will include swale preparations, roadways (including stone and textile), cell disposal areas, and other improvements. Additionally, the placement of topsoil, seed, mulch, sodding and road extensions at locations noted on the plans is included in this item. Erosion control will include silt fences between the toe of the roadway and the 100 year flood line noted on the drawings.

All excavated material shall be stored and used for fill or stockpiled. Soils to be stockpiled are to be transported to a location suitable to the County within the cleared area adjacent to the cell construction.

Payment will be made at the Contract Unit Price Bid for the item, which shall be full compensation for on-site removal of material, hauling in suitable vehicles, on-site stockpiling of material within the landfill site, and incidental work required to complete this item.

C. CELL 7 LINER SYSTEM INSTALLATION

Complete installation of the bottom liner installation for Cell 7 including GCL, 60 mil HDPE Secondary Liner geomembrane and the 60 mil HDPE Conductive Primary Liner both textured on both sides, triplanar and triaxial geocomposites, protective cover soil (24-inches), and rain tarp.

All items except the protective cover soil will be based on square yardage of materials in place. The additional layer of liner under the sump is included in the
60 Mil HDPE line item. The contractor should stockpile the top 3 feet of existing soil within the cleared area for the fill material to be placed on top of the liner under this section for protective cover material. The cost of stockpiling the protective layer soil and placement in accordance with the drawings will be based on a cubic yard basis of soil compacted in place within the cell and cover of the liner system on the berms. The rain tarp will be as per the specification and includes material and installation including the sandbag filling and placement on the liner. The primary liner will be a conductive 60 mil liner textured on both sides. The Contractor shall include all work required for furnishing and installing the liner system and incidental work required to complete this item.

Payment will be made at the Contract Unit Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item.

D. CELL 7 LEACHATE COLLECTION SYSTEM

Complete installation of the leachate collection system piping and valves at locations depicted on the Contract plans will be used for payment including the complete installation of the header pipe, lateral pipes, and toe drain pipes on a linear foot unit price basis. The non-woven will be paid by the square yard unit price of material placed. All other materials including the riser pipes, the transducer pipes, and the river rock will be paid as Lump Sum items. Valves and appurtenances include all materials shown on the drawings to convey the leachate to the forcemain, header pipes, lateral pipes, cleanouts, riser pipes, and piping detection. The rounded river rock serves as a drainage media in the laterals, header, sump, toe drains and as per the drawings. The Contractor shall include all materials, labor, equipment, and tools required for placement of the system, and all other necessary incidental work required for the complete installation of a fully functional system at Cell 7.

Payment will be made at the Contract Lump Sum Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item and providing a functioning system.

E. CELL 7 STORMWATER PIPING AND STRUCTURE SYSTEMS

Complete installation of the stormwater management system including pipe and structures as noted on the drawings. The Contractor shall include all materials, labor, equipment, and tools required for placement of the stormwater structures, and all other necessary incidental work required for the complete installation of the systems in accordance with the plans.
Payment will be made at the Contract Lump Sum Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item.

F. LEACHATE PUMPING SYSTEM

Near the northwest corner of Cell 7 a leachate pumping system will be installed in that cell that will remove leachate from the cell and pump it into a 10” x 14” dual wall forcemain. A new electrical control panel will be installed (see electrical drawing). One new pump will be installed for the primary leachate collection zone and one new pump will be installed for the secondary leachate collection zone. The secondary pump will be piped to divert flow into the primary pump riser. The proposed dual wall forcemain will be extended from the leachate pumping system at Cell 7 to the existing manhole located near the Cell 5 leachate risers, as shown on Sheet 6 and 8 of the Drawings. A duplicate of each pump is to be provided to the County as a spare. Additionally, the stormwater pump to remove stormwater from the rain tarp will be installed and connected to the appropriate controls (see electrical drawing).

Work will include installation of the stormwater 4” discharge hose from the pump to the stormwater drop inlet at the northeast corner of Cell 7, pipe, fixtures, and valves; and pressure testing of the dual wall extension of the existing forcemain; installation of all pumps and associated electrical services; testing of the system; training of County Staff for the electrical and pump control system (Cell 7).

Payment will be made at the Contract Lump Sum Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, valves, meters, and tie-ins, and incidentals required to complete this item in providing a fully functional system.

ADD ALTERNATE FOR CELL 8A

G. SITE WORK

Work includes preparation of the subgrade to the elevations noted on the drawings including compaction and fine grading. The cut/fill items are included should soils not meeting the compaction standards need to be removed and replaced. Subgrade Preparation will include placement and compaction of soils and fine grading to the elevations noted on the drawings for the top of subgrade including berms and will be paid per square yard. Topsoil and sodding is to be placed on the outside slopes of the northern berm, in the swales and perimeter road side slopes. The seed and mulch if any will be as per directed by the County in the area of the project. Work will include swale preparations, roadways (including stone and textile), cell disposal areas, and other improvements.
All excavated material shall be stored and used for fill or stockpiled. Soils to be stockpiled are to be transported to a location suitable to the County within the cleared area adjacent to the cell construction.

Payment will be made at the Contract Unit Price Bid for the item, which shall be full compensation for on-site removal of material, hauling in suitable vehicles, on-site stockpiling of material within the landfill site, and incidental work required to complete this item.

H. LINER SYSTEM INSTALLATION

Complete installation of the bottom liner installation for Cell 8A including GCL, 60 mil HDPE Secondary Liner geomembrane and the 60 mil HDPE Conductive Primary Liner both textured on both sides, triplanar and triaxial geocomposites, protective cover soil (24-inches), and rain tarp. All items except the protective cover soil will be based on square yardage of materials in place. The contractor should stockpile the top 3 feet of existing soil within the cleared area for the fill material to be placed on top of the liner under this section for protective cover material. The cost of stockpiling the soil and placement in accordance with the drawings will be based on a cubic yard basis of soil compacted in place within the cell and cover of the liner system on the berms. The rain tarp will be as per the specification and includes material and installation including the sandbag filling and placement on the liner. The Contractor shall include all work required for furnishing and installing the liner system and incidental work required to complete this item.

Payment will be made at the Contract Unit Price Bid or Lump Sum Bid as appropriate for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item.

Payment will be made at the Contract Lump Sum Price Bid for the item, which shall be full compensation for on-site removal of material, hauling in suitable vehicles, on-site stockpiling of material, and incidental work required to complete this item.

I. LEACHATE COLLECTION SYSTEM

Complete installation of the leachate collection system piping at locations depicted on the Contract plans will be used for payment including the complete installation of the lateral pipes, cleanouts, and toe drain pipes on a linear foot unit price basis. The non-woven will be paid by the square yard unit price of material placed. All other materials including the riser pipes and the transducer pipes will be paid as Lump Sum items. The Contractor shall include all materials, labor, equipment, and tools required for placement of the system, and all other necessary
incidental work required for the complete installation of a fully functional system at Cell 8A.

Payment will be made at the Contract Lump Sum Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item and providing a functioning system. Payment will be made at the Contract Lump Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item.

J. STORMWATER PIPING AND STRUCTURES

Complete installation of the stormwater management system including pipe and structures as noted on the drawings. The Contractor shall include all materials, labor, equipment, and tools required for placement of the stormwater structures, and all other necessary incidental work required for the complete installation of the systems in accordance with the plans.

Payment will be made at the Contract Lump Sum Price Bid for the item, which shall be full compensation for all materials, labor, equipment, tools, and incidentals required to complete this item.

END OF SECTION
SECTION 01027

APPLICATIONS FOR PAYMENTS

PART 1 - GENERAL

1.01 PAY REQUEST SUBMISSION

Submit applications for payment to the Engineer in accordance with schedule established by General Conditions of the Contract and Contract between Owner and Contractor. Contractor shall use the Application for Payment form provided in Section 00830 as the official pay request form.

1.02 FORMAT AND DATA REQUIRED

A. Submit applications typed on forms provided in Section 00830, with itemized data typed on 8 ½” x 11” or 8 ½” x 14” white paper continuation sheets.

B. Provide itemized percent completed items according to work items listed in the schedule of values accepted by the Engineer.

C. Provide from each subcontractor/supplier, a Subcontractor’s/Supplier’s Certification on form provided in Section 00830.

D. Provide construction photographs in accordance with Section 00700, paragraph 16.6.

E. Provide Sales Tax Report on form provided in Section 00830. This report shall include a list of sales tax paid during one pay period lagging the period described in the application for payment.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.

2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.

3. Execute certification with signature of a responsible officer of Contractor.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of work, with item number and scheduled dollar value for each item.
2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.

3. List each Change Order executed prior to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item of work.

4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices with the application for payment. Any materials stored on site that are included in the pay request must be installed prior to the next pay request submitted.

5. As provided for in the "Certification of Contractor" form, the Contractor shall certify, for each current pay request, that all previous progress payment received from the Owner, under this Contract, have been applied by the Contractor to discharge in full all obligations of the Contractor in connection with Work covered by prior Applications for Payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest and encumbrances.

Contractor shall attach to each Application for Payment like affidavits by all Subcontractors.

6. Contractor will complete the sales tax form with each pay request and will maintain records of the sales taxes should the County need receipts for confirmation of the information.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. For stored products:

   a. Item number and identification as shown on application.

   b. Description of specific material.

B. Submit one copy of data and cover letter for each copy of application.
C. The Contractor is to maintain an updated set of drawings to be used as record drawings in accordance with Section 01720. As a prerequisite for monthly progress payments, the Contractor is to exhibit the updated record drawings for review by the Owner and the Engineer.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. As a prerequisite for final payment, Contractor is to submit a "Consent of Surety" acknowledgement of final payment request letter showing amount of payment which the Contractor is requesting.

1.06 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to the Engineer at the time stipulated in the Agreement.

B. Number of copies for each Application for Payment:

1. Owner: Two (2) copies

2. Engineer: Two (2) copies

3. Contractor: As required for his needs

C. When the Engineer finds Application properly completed and correct, he will transmit certificate for payment to Owner, with copy for Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
1.01 UTILITIES

A. The Contractor is responsible for providing any water, power, and sanitary facilities required at the site for the performance of the Work in accordance with the Contract Documents.

1.02 PERMITTING

A. The Contractor shall obtain all Federal, State, County and local permits as required.

1.03 ENVIRONMENTAL PROTECTION

A. The Contractor is specifically cautioned on the following items:

1. Excavations in and Around Landfills: All excavations shall be confined to the immediate area of the work for which the excavation is required.

2. Environmental Constraints:
   a. Dust Control: Trucked water or calcium chloride shall be used if necessary to prevent dust.
   b. Odors: Excavated materials causing odors shall be trucked to an area for disposal as designated by the Owner. Emphasis shall be given to the reduction of any other circumstances causing odors.
   c. Explosion Protection: The Contractor shall be responsible for enforcing all explosion protection precautions according to the National Landfill Gas Committee Health and Safety Guidelines.
   d. Fire Control: The Contractor shall be responsible for fire control and submit a safety plan and fire control procedures (to which he will adhere during the entire Contract time) to the Engineer for review. The plan will address in detail those items listed in paragraph 1.04 of this section.
   e. Litter: The Contractor shall be required to control, collect, and truck all litter excavated or exposed by the Work to an on-site disposal area as directed by the Owner.
f. Fuel Containment: The Contractor shall provide for any temporary fuel stations for the operation of the equipment for this project. All tanks must have secondary containment consistent with current regulations to avoid impacting the site groundwater and soils.

3. Landfill Construction Procedures: Contractor operations shall not interfere with work performed by others.

1.04 SAFETY

A. Trench Safety - The Contractor shall comply with all of the requirements presented in the 0300 Section regarding trench safety. **FAILURE TO COMPLY WITH THE REQUEST IN THIS SECTION SHALL RESULT IN THE BID BEING DECLARED NON-RESPONSIVE.**

B. Work In and Around Landfills: All work shall be done in accordance with State and local requirements and OSHA Safety and Health Standards 29 CFR and shall conform to the Landfill Gas Division of the Solid Waste Association of North American (SWANA) A Compilation of Landfill Gas Field Practices and Procedures, most current version.

1. General

The Occupational Safety and Health Act (OSHA) of 1970 impose a duty on employers to furnish a safe and healthful job environment for all employees. The employees are required to comply with safety rules and regulations applicable to their activities and conduct. Employers have the obligation not only to eliminate recognized hazards and to comply with national safety and health standards, but also to provide information and training to create the necessary awareness on the part of the employees.

Landfill safety requires more than the common sense safety procedures common to all industry. Bacterial decomposition of trash results in the formation of methane, a colorless, odorless, explosive gas that together with other volatile materials evolves into the atmosphere and migrates through the soil into surrounding areas. Air quality studies consistently show that concentrations of potentially hazardous substances (OSHA "Priority Pollutants) in the ambient air in the vicinity of solid waste landfills are well below threshold limits. However, in confined or enclosed areas on or adjacent to landfills, dangerous concentrations of combustible and possibly toxic gases may accumulate. Oxygen depletion may also occur in these areas of confinement; therefore, safety procedures should be followed at all times.

2. Safety Equipment
Workers engaged in construction or maintenance of landfill gas (LFG) facilities should wear protective safety equipment as follows:

a. Hard hats, if near moving mechanical equipment.

b. Steel-toed, shoes or rubber boots with steel shank.

c. Safety glasses or face shields, as appropriate.

d. Protective gloves (rubber or plastic would work if working with wet solid waste or where exposure to leachate/condensate is expected).

e. Hearing protection, depending on noise level of work environment.

The following safety equipment shall be made available by Contractor at the job site in quantities sufficient to cover the Contractor’s construction crew:

a. Clean water, soap and paper towels.

b. First aid kit, eye wash station, stretcher, and blanket.

c. Fire extinguisher (2) - 20:A-80:BC.

d. No smoking signs.

e. Acid vapor and particulate masks for all personnel.

f. Parachute-type harnesses (2) and safety lines (for use in excavations, manholes, etc.).

g. Self-contained breathing apparatus.

h. Methane/oxygen indicator.

i. Hydrogen sulfide indicator (Draeger Tubes).

j. Additional monitoring equipment for toxic vapors and aerosols.

k. Barricades.

l. Covers for excavations that will remain open at end of working day.
m. Air-moving equipment that can provide ventilation if working in sub-standard air environment (trenches, condensate drain pits, etc.).

n. Fire blanket.

o. Organic vapor masks.

p. Construction equipment equipped with vertical exhaust or spark arrestors if within 2 feet of ground.

q. Flagging, traffic markers, and florescent orange safety vests for use when working around operating equipment or near public roadways.

3. Personal Health and Hygiene

a. Personal safety and the safety of fellow workers require that all employees are mentally alert and in good general health. No alcohol or drugs are permitted. Smoking is prohibited on the landfill site except in designated areas. No worker should handle excavated solid waste without wearing gloves. Parts of the body accidentally exposed to waste, leachate or condensate should be washed with soap and water immediately.

b. An annual medical examination also is recommended for workers whose activities include daily exposure to solid waste or LFG. Any cut or abrasion should be treated immediately as the chance of infection is high when working on a landfill. A tetanus shot and hepatitis B shot is recommended at specified intervals for all personnel involved in site construction.

c. Avoid contact with unfamiliar plants or those known to be hazardous growing on the landfill.

d. Animals, snakes, spiders, and other insects should be avoided. Be particularly careful around vaults and valve boxes.

e. The address, phone number, and location map of the local hospital and medical emergency room shall be prominently posted. In addition, the phone number of an ambulance and fire department/rescue unit should be posted.

f. Wash hands prior to eating and before leaving work area.

4. Landfill Safety Procedures
a. As a general rule LFG work shall be performed by a team composed of a minimum of two (2) people. In situations where hazards are minimal, and where it's necessary to allow an individual to work alone, another responsible individual must be aware of the lone workers task and scheduled time of completion/return, and if possible monitor the individual’s progress.

b. When working on (or within 1,000 feet of) an active or completed solid waste disposal area, be alert to the existence of (or potential for) hazardous conditions, i.e., the presence of LFG. The distance of 1,000 feet is used by some authorities as the maximum distance LFG will migrate through soils under average conditions. Migration distance, however, may be greater through underground conduits, or where surface conditions interfere with normal venting.

Hazards that might occur could be one or more of the following:

1) Fires may start spontaneously from exposed and/or decomposing solid waste.

2) Fires and explosions may occur in confined or enclosed spaces from the presence of methane gas.

3) LFG may cause an oxygen deficiency in underground trenches, vaults, conduits, and structures.

4) Hydrogen sulfide (H\textsubscript{2}S) may be present. H\textsubscript{2}S is a colorless, very flammable gas which, in low concentrations, has an offensive odor described as that of rotten eggs. H\textsubscript{2}S, however, quickly numbs the olfactory senses so that reliance upon the sense of smell can lead to a very dangerous condition and even cause virtually instant death.

5) Sudden subsidence or collapse of the landfill surface.

c. A confined space is defined as a space where existing ventilation is insufficient to remove dangerous air contamination and/or oxygen deficiency, and where ready access/egress to escape, provide aid and to remove a disabled employee is difficult. In the case of flammable gases, such as methane, a hazardous concentration is defined as any concentration greater than 20 percent of the lower atmosphere containing less than 19.5 percent oxygen by volume.
In the absence of positive ventilation, a mixture of 5 percent LFG in air will exceed both of these limits.

d. Vaults and ditches greater than 3 feet and other non-ventilated confined spaces should not be entered unless tested for explosive concentrations, oxygen deficiency and H₂S levels. Air blowers or fans should be available for positive ventilation. Self-contained breathing apparatus or supplied-air masks must be used when entering areas containing hazardous and/or oxygen deficient atmospheres. "Chemical" cartridge respirators can be used for gaseous contaminants (not H₂S) if oxygen concentration is satisfactory. Mechanical filter respirators should be used only for protection against particulate matter.

e. Fires or explosions in confined spaces require a source of ignition. Smoking is strictly forbidden except in designated areas. Non-sparking and/or explosion proof tools should be used in vaults, trenches, or other enclosed areas. Positive ventilation is required in construction shacks or other structures on or near a landfill. Temporary structures on the landfill surface should be constructed on blocks or other supports with a ventilated area under the main floor. Construction equipment should be equipped with vertical exhaust and spark arrestors.

f. Hydrogen sulfide gas is always present in LFG in some concentrations, generally below 100 parts per million (ppm), in LFG. It is unlikely that hazardous concentrations of H₂S will build up (see Table 1) except in vaults or other confined spaces where oxygen deficiency may be a major hazard. However in special circumstances, where there is a natural or manmade presence of gypsum along with high moisture, for example, very high (lethal) concentration levels of H₂S gas could be encountered under certain circumstances. Personnel must be trained for, and alert to, these possibilities. Gas masks are not effective against H₂S and fresh air breathing equipment is required.

g. Employees who wear beards shall not work in areas where air masks or respirators may be necessary. Other employees should not use stand-by people wearing beards. All employees should be fit-tested on the respirator that they will wear in order to assure a proper facepiece seal against the face. Fit-testing should reoccur at least annually.
TABLE 1

PHYSIOLOGICAL RESPONSE TO VARIOUS CONCENTRATIONS OF HYDROGEN SULFIDE

<table>
<thead>
<tr>
<th>Response</th>
<th>Concentration/PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum allowable concentration for Prolonged exposure</td>
<td>10</td>
</tr>
<tr>
<td>Slight symptoms after several hours.</td>
<td>70-150</td>
</tr>
<tr>
<td>Maximum concentrations for one hour without serious consequences</td>
<td>170-300</td>
</tr>
<tr>
<td>Dangerous after exposure of one-half to one hour.</td>
<td>400-700</td>
</tr>
</tbody>
</table>

NOTES:

1. Most landfills do not have H₂S in concentrations greater than 10 PPM. However, concentrations up to 250 PPM have been measured.

2. In many cases, laboratories do not know how to properly analyze for H₂S. Draeger tube check analyses are generally more accurate than most laboratories.

5. Safety Procedures for Trenching and Pipe Installation

a. Excavation permits and shoring may be required for excavations deeper than 4 to 5 feet (into which workers will enter). Check state regulations as standards and requirements vary.

b. One person, with the sole responsibility of assuring the observance of all safety procedures, should be present at all times during construction. This person should be trained in the use of all the recommended safety equipment.

c. Smoking is prohibited within 50 feet of the construction area. No smoking on the landfill except in designated areas.

d. Prior to the entry of workers into an excavation deeper than 3 feet, and periodically during their work, the atmosphere in the excavation should be tested. If there are any doubts regarding
safety, no worker shall be allowed to enter the excavation without at least a half-face or full-face OV/AG mask. If there is an oxygen deficiency, a concentration of any constituent with poor warning properties at a level greater than its TLV, or a concentration of hydrogen sulfide greater than 10 ppm, a positive pressure SCBA or supplied air respirator with 5 minute emergency escape bottle should be used. If a combustible mixture of methane is present, further precautionary measures shall be taken; entry should be forbidden until the methane concentration is acceptable and at least below 1.0 percent by volume in air, or 20 percent of the LEL. If workers are not equipped with supplied air or pressure-demand SCBAs, then entry should be forbidden until the methane concentration is below 0.1 percent by volume in air, unless the Maximum Use Limitation (Mul) of the APR is greater. Workers required to work on an emergency basis, in any environment at or above the IDLH (the level immediately dangerous to life and health as declared and published by NIOSH) for any constituent component in the working environment, should be outfitted in pressure-demand SCBAs.

e. No worker should be allowed to work alone at any time in or near the excavation. Another worker should be present, beyond the area considered to be subject to the possible effects of LFG.

f. Periodically during construction the work area should be monitored for levels of methane and hydrogen sulfide.

g. No worker should handle excavated solid waste without wearing appropriate work gloves.

h. Construction equipment should be equipped with a vertical exhaust at least 5 feet above grade and with spark arrestors.

i. Electrical motors, if used in the excavation area, shall be explosion-proof or non-sparking, totally enclosed fan cooled (TEFC); and electrical controls should be explosion-proof or intrinsically safe and meet the requirements for Class I, Division 2, Group D, (Methane), rated equipment in accordance with the National Electric Code (NEC).

j. No welding should be permitted in, on, or immediately near the excavation area, unless previously and continuously monitored for methane and other combustible gases.
k. Soil should be stockpiled near the excavation, to be used to smother any solid waste combustion should it occur.

l. Solvent cleaning, gluing, or bonding of pipe should be performed to the extent possible, outside the trench. An organic vapor respirator shall be worn by persons using PVC solvents or glues. Personnel using solvent and cement shall be familiar with the appropriate materials safety data sheets for those products.

m. Forced ventilation may be required for workers who must work in trenches deeper than 3 feet. Air blowers and fans may be used for positive ventilation. Dilution ventilation may address either an explosive gas hazard or a hazardous chemical health hazard. The amount of air required for ventilation must be determined based on the concentrations of explosive LFG or hazardous chemical constituents, the LEL for methane or the TLVs for the hazardous chemical constituents in question, the volume to be protected, ambient conditions, and an appropriate safety factor. These calculations should be performed by a qualified individual.

n. During piping assembly, all valves should be closed immediately after installation.

o. As construction progresses, all valves should be closed as installed to prevent the migration of gases through the pipeline and gas collection system.

p. All piping shall be capped at the end of each working day.

6. General Construction/Maintenance

a. When using alternating-current powered power tools, a portable ground-fault current interrupter (GFCI) should be used.

b. When welding near gas recovery process equipment, suitable procedures and precautions should be employed including:

1) Processing a "hot work" permit. (A self-issued serial numbered permit is required in many states.)

2) Designate a specific, dedicated individual, by name, as a fire watch.

3) Verify that explosive concentrations are not present using an explosimeter.
4) Have adequate fire extinguishers (20:A-80:BC) and fire blankets on hand.

5) Sandbag all drains.

6) Provide the appropriate purge and inert blanket on process equipment and piping.

7) Procedures for safe welding and purging of process equipment are available from the American Petroleum Institute (API).

7. Field Sampling for Health and Safety

a. The following instruments will remain at the job and be continuously employed by a qualified person:

1) H₂S chemical reagent diffusion tube indicator or direct reading instrument.

2) Oxygen Analyzer

3) CGA (methane analyzer).

b. CGAs and other electronic portable monitoring instruments should be rated explosion-proof or intrinsically safe. It is also recommended that they be Factory Mutual rated.

c. It is important that any site always be initially characterized so that correct information can be available to make appropriate decisions about personnel exposure safety.

d. To accomplish Item C, a gas sample should be collected prior to the beginning of work or as soon as possible, and should be analyzed for volatile organic chemicals. If historical information or preliminary field screening indicate a need, the sample should also be analyzed for heavy metals capable of volatizing, acid gases, and other inorganic compounds. Proper instructions and close coordination with the laboratory are important to properly characterize the gas. Several composite samples will provide a more uniform representation of LFG at the site. Several non-composited samples, may however, provide a better indication of peak concentrations and show chemicals which would not be indicated in the composite samples.
e. Monitoring for vinyl chloride, benzene, or other constituent chemicals may also need to be conducted during drilling operations. A written record of monitoring should be maintained daily.

8. Respiratory Protection

a. All employees who may be required to wear respirators shall be trained in the proper use of respirators. Such individuals will have an appropriate physical examination for use of respirators. Each individual will be approved by a qualified physician for such respirator use. All personnel who wear respirators shall come under the jurisdiction of their employer's written respiratory protection program, and will follow and be knowledgeable about the program. Personnel will be individually fit-tested wearing their assigned respirator. Fit-testing should be performed annually.

b. Persons with interfering facial hair shall not be permitted in areas where respiratory protection equipment is required; i.e., beards are prohibited.

c. Permanent damage to the eyes (cornea) from acid gases and particulates may result if contact lenses are worn. Therefore, wearing contact lenses on site shall be prohibited. Those persons shall have prescription spectacle inserts installed in their respiratory protective equipment.

d. All NIOSH procedures and guidelines for respirator selection and use should be adhered to. Only equipment certified by NIOSH in its most recent certified equipment list will be used. APRs with chemical cartridges can only be used for acid gas/organic solvent vapors under the following conditions:

1) If the oxygen concentration is satisfactory.

2) If the chemical contaminants have been identified.

3) The concentrations are monitored.

4) The chemical filter cartridges are effective in removing the contaminants.

5) The cartridges are approved for such use (by NIOSH).

6) The contaminants have good warning properties.
If all of the above conditions cannot be satisfied, then Level B protection using positive-pressure SCBAs or supplied air is required. APRs with chemical cartridges/canisters will not be used for protection in environments containing constituents which have poor warning properties, and which are at or above, or can reasonably be expected to be near, at, and/or above the limitation of the protection factor (PF) for the respirator. The maximum working environment shall be determined by multiplying the PF for the type of respirator by the TLV for the chemical substance under consideration, (MUC = PF X TLV). A list of PFs is shown in Table 2.

e. Positive-pressure SCBA or supplied-air full-face masks shall be used when entering areas containing oxygen-deficient atmospheres, unknown atmospheres, or atmospheres considered to be at or above IDLH levels. Personnel (with appropriate SCBA apparatus) will not enter IDLH environments without emergency justification by and acceptance of a site safety manager or responsible project manager. An emergency is constituted by an already existing life threatening situation.

f. The length of time an APR canister or cartridge is effective in removing hazardous material from the ambient air will depend on the type and concentration of hazardous material in the air and the level of effort required for a worker to accomplish his assigned tasks. The higher the breathing rate, the more frequently canisters will need to be replaced. These maximum operating periods vary according to manufacturer, so it will be necessary to monitor the total usage of cartridges and canisters during all work requiring a respirator.

### TABLE 2

**TABLE OF RESPIRATORY PROTECTION EQUIPMENT PROTECTION FACTORS**

<table>
<thead>
<tr>
<th>Type of Air Purifying Respirator</th>
<th>Protection Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-face APR</td>
<td>10</td>
</tr>
<tr>
<td>Full-face APR</td>
<td>100</td>
</tr>
<tr>
<td>When employed for protection from benzene. See Note 1.</td>
<td>50</td>
</tr>
</tbody>
</table>
When employed for protection from vinyl chloride using vinyl chloride rated specific canister with a 4 hour service life. See Notes 2 and 3.

| Positive-Pressure SCBA or supplied air-line respirators | 10,000 |

NOTES:


3: Because respirator cartridges/canisters meeting the service life requirements listed in 29 CFR 1910.1017 (g) are not normally available, work involving vinyl chloride concentrations above the action level of 0.5 ppm will require use of pressure-demand SCBAs.

9. Special Conditions

   Certain types of work may present unusual problems at certain sites with special conditions. Examples include the following:

   a. For protection against infectious waste, a coated Tyvek or Sentex suit, appropriate gloves and boots, and a NIOSH-approved respirator with a high-efficiency particulate filter (HEPA) incorporated in the mask canister or cartridge, are suggested. Personnel should avoid or minimize contact with any waste, and be cautioned about possible contact with sharp objects such as needles. The HEPA filter may be combined with an OV/AG cartridge or canister.

   b. For protection against gas vapors while drilling or while working around an open well casing, a NIOSH-approved full-face air-purifying respirator with an OV/AG canister including a HEPA filter may be necessary. The Saranex or Tyvek suit is also required. Also, appropriate gloves and boots. Appropriate measures may be taken to prevent heat stress.

   c. For protection from asbestos fibers, the minimum required includes a respirator with a HEPA filter and a Tyvek suit. The Tyvek suit may either be coated or uncoated. Special regulations exist for asbestos, for complete requirements see the Asbestos Standard, 29 CFR 1910.1001.
d. A determination may need to be made regarding whether additional protection will be required, if significant levels of vinyl chloride or benzene (or other more toxic chemicals) are found during characterization. The action levels for vinyl chloride and benzene are one-half of 1 ppm. The maximum threshold limit value of benzene or vinyl chloride to which workers may be exposed over an 8-hour period is 1 ppm. The maximum concentration of vinyl chloride to which workers may be exposed in any given period is 5 ppm. If higher levels of vinyl chloride are found, respiratory protection levels may need to be adjusted to Level B (SCBA or supplied air) if engineering controls cannot reduce these levels. Because vinyl chloride and benzene are both regulated carcinogens, it is imperative and required that exposure be limited where at all possible; if not, then exposure must be reduced to the minimum possible extent through appropriate respiratory protection (i.e., vinyl chloride and benzene exposure should be held to zero whenever possible). For the Vinyl Chloride Standard, see 29 CFR 1910.1017. For the Benzene Standard, see 29 CFR 1910.1028.

e. Special compliance requirements apply for personnel who must work with potential exposure to certain chemicals including vinyl chloride, benzene, and asbestos above action levels. Compliance requirements may vary with each compound and by state, but will likely include:

1) Mandatory training
2) Medical record keeping
3) Exposure monitoring, and record keeping
4) Certifications
5) Specific protective equipment requirements

10. Shoring and Bracing

a. No person shall enter any trench five feet or more in depth unless that trench has been shored, braced, sloped, or other provisions made to prevent cave-in. Shoring shall be engineered by a qualified and licensed civil or structural engineer or engineering geologist. Drawings, specifications, and calculations shall be signed by Contractor’s engineer.
b. Special consideration must be given to the less stable conditions represented by refuse in comparison with compacted soil. Refuse must be considered more prone to instability that may cause slope or side wall failure. This is due to the high void ratio, irregularity of material composing the refuse, and a typically lesser degree of compaction than soil.

11. Safety Management

a. No safety program can be effective without management support and interest. It is recommended that all companies involved in the LFG industry initiate a safety program for the protection of the health and safety of the personnel involved.

b. Safety procedures shall be reviewed with all workers to insure that they are aware of requirements and safety concerns.

c. The Safety Officer shall be adequately qualified to insure that they are aware of requirements and safety concerns.

d. Weekly meetings shall be held to review unsafe acts.

e. Unsafe acts shall be stopped if discovered by the Safety Officer.

f. Required safety equipment shall be on-site and shall be checked to verify completeness and function.

g. Contracts for landfill gas testing, construction or operation should include a safety procedure clause.

h. All employees on the job site should sign a document of their awareness of their work environment.

i. Appropriate local authorities (fire department, air quality, etc.) should be notified prior to drilling or flaring.

j. A safety checklist should be maintained at the job site.

12. NOTE THAT THE COUNTY HAS A HEALTH AND SAFETY DOCUMENT THAT THE CONTRACTOR WILL BE REQUIRED TO REVIEW AND ENDORSE.

END OF SECTION
SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.01 OBSTRUCTIONS

A. All water pipes, storm drains, force mains, telephone or power cables or conduits, and all other obstructions, whether or not shown, shall be temporarily removed from or supported across pipeline excavations. Before disconnecting any pipes or cables, the Contractor shall obtain permission from the OWNER, or shall make suitable arrangements for their disconnection by the OWNER. The Contractor shall coordinate these operations with the OWNER. The Contractor shall be responsible for any damage to any such pipes, conduits or cables, and shall restore them to service promptly as soon as the work has progressed past the point involved. Approximate locations of known water, sanitary, drainage, power and telephone installations along route of new pipelines or in vicinity of new work are shown, but must be verified in the field. The Contractor shall uncover these pipes, ducts, cables, etc., carefully, by hand, prior to installing new piping. Any discrepancies or differences found shall be brought to the attention of the OWNER in order that necessary changes may be made to permit installation of new pipe. These conditions are supplemental to general requirements elsewhere in these specifications.

1.02 DAMAGE TO EXISTING STRUCTURES AND UTILITIES

A. The Contractor shall be responsible for and make good all damage to roads beyond the limits of this Contract, buildings, telephone or other cables, water pipes, sanitary pipes, or other structures which may be encountered, whether or not shown on the Drawings.

B. Information shown on the Drawings as to the location of existing utilities has been prepared from the most reliable data available to the ENGINEER. This information is not guaranteed, however, and it shall be this Contractor's responsibility to determine the location, character and depth of any existing utilities. He shall assist the utility companies, by every means possible to determine said locations. Extreme caution shall be exercised to eliminate any possibility of any damage to utilities resulting from his activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Provide and pay for field engineering services for the Project. The Contractor is to perform several surveys to define the existing conditions, elevations and horizontal location of layers of materials and structures in the project area, construction stakeout, and final survey of the project area. The vertical information on the project drawings is based on a previous aerial survey and the County has recently conducted a clearing operation to make the site available for this project. Since the clearing operation has changed the ground surface conditions, the Contractor is to provide a field survey that will be the basis of payment for cut and fill grading activities. To the north of the proposed Cell 7 is an existing borrow pit which now serves as a stormwater management basin. The Contractor will be required to do additional clearing to provide for widening of the perimeter road. This will require some fill in the water of the basin. The initial survey will need to address the elevation at the soil level under the water. See the drawings for this location and grading plan.

Additional detailed topographic surveys shall be performed by the Contractor to document suitable thickness of the liner system components as follows:

1. At a minimum, field surveys shall be conducted for Cell 7 and if approved for the additional work Cell 8A. The survey will be conducted at completion of the following soil layers:

   a. Existing condition survey prior to initiating the construction.

   b. Finish grade of the top of Liner Subgrade, after final preparation by the Contractor is completed (to use for payment of in place quantities as compared by AutoCAD to the initial preconstruction survey and to ensure proper slopes).

   c. Top of Liner system to establish the horizontal/vertical locations of the liner material

   d. Top of 24” protective cover soil layer (to ensure proper slopes and thickness of the cover material). Note depth checks will be used to assure minimum depths are met. This information will also be used to calculate in place soils.
Ten sets of signed and sealed documents prepared by a North Carolina Registered Surveyor and one electronic copy will be provided to the County for each survey. These documents will be used in the certification submittal to DENR.

2. Measure elevations on a minimum 50-foot grid over the entire area and at all breaks in grade, including one row of points on slopes.

3. Accuracy: Within 0.1 foot vertical and 0.5 feet horizontal in accordance with national surveying standards.

4. Results of the topographic surveys shall be plotted in plan to a scale similar to the Drawings and shall be submitted to the ENGINEER within 48 hours. A single record drawing, signed/sealed, reflecting horizontal locations and elevations for the design elevations of exiting grade, as-built subgrade, as built liner system, design final grade and as-built final grade at each grid intersection shall be submitted to the ENGINEER within two (2) weeks of Substantial Completion.

5. The Contractor shall be responsible for establishing all lines and grades together with all reference points as required by the various trades for all work under this Contract. All required layout shall be done using competent and experienced personnel under the supervision of a Land Surveyor registered in the State of North Carolina.

6. The Contractor shall provide all labor and instruments and stakes, templates, and other materials necessary for marking and maintaining all lines and grades. The lines and grades shall be subject to any checking the OWNER or ENGINEER may decide necessary.

7. No separate cost item is provided for laying out the work, the cost of which shall be included in the prices for items in the Bid.

B. Related Work Described Elsewhere:

1. Geosynthetic Clay Liner: Section 02776

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Before starting work, the Contractor shall obtain and pay fees for all required licenses and permits.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 ABBREVIATIONS

A. References in the specifications to technical societies, organizations, or bodies are made in accordance with the following abbreviations:

- AASHTO - American Association of State Highway & Transportation Officials
- AISC - American Institute of Steel Construction
- ANSI - American National Standard Institute
- ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
- ASME - American Society of Mechanical Engineers
- ASTM - American Society for Testing and Materials
- AWSC - American Water Works Association
- CFR - Code of Federal Regulations
- CRSI - Concrete Reinforcing Steel Institute
- CS - Commercial Standard
- NCDOT - North Carolina Department of Transportation
- IEEE - Institute of Electrical and Electronic Engineers
- NFPA - National Fire Protection Association
- NSF - National Sanitation Foundation
- OSHA - U.S. Department of Labor, Occupational Safety and Health Association
- PCA - Portland Cement Association
- UL - Underwriter's Laboratories, Inc.

B. In the event that a complete title and abbreviation for a society, organization or body is not listed herein, references to specifications or standards of the unlisted society, organization or body will be made using the full title of the society, organization or body.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION
1.01 DESCRIPTION

A. Scope of Work:

1. The Engineer shall schedule and administer a preconstruction meeting, periodic progress meetings, and specially called meetings throughout the progress of the work. The Engineer shall:
   a. Prepare agenda for meetings
   b. Make physical arrangements for meetings
   c. Preside at meetings

2. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

3. The Contractor shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules. Contractor shall record the Pre-Construction meeting and each Progress meeting in their entirety, and shall provide the Engineer a regular cassette copy of such recording, having good quality and clarity, and a typed transcript of the minutes of each meeting. A copy of the minutes of each progress meeting shall be available forty-eight (48) hours before the next scheduled meeting.

B. Related Requirements Described Elsewhere:

1. Construction Schedules: Section 01310
2. Shop Drawings, Working Drawings, and Samples: Section 01340
3. Project Record Documents: Section 01720

1.02 PRECONSTRUCTION MEETING

A. A preconstruction meeting shall be scheduled for no later than five (5) days after date of Notice to Proceed.

B. Location: The Owner's office.
C. Attendance:

1. Owner's representative
2. Engineer and his professional consultants
3. Resident project representative
4. Contractor's superintendent
5. Major subcontractors
6. Major suppliers
7. Utilities
8. Others as appropriate

D. Suggested Agenda:

1. Distribution and discussion of:
   a. List of major subcontractors and suppliers
   b. Projected schedules

2. Critical work sequencing: Relationships and coordination with other contracts and/or work.

3. Major equipment deliveries and priorities.

4. Project coordination: Designation and responsible personnel.

5. Procedures and processing of:
   a. Field decisions
   b. Proposal requests
   c. Submittals
   d. Change orders
   e. Applications for payment

6. Submittal of Shop Drawings, project data and samples.

8. Procedures for maintaining Record Documents.

9. Use of premises:
   a. Office, work and storage areas.
   b. Owner's requirements.
   c. Access and traffic control.

10. Construction facilities, controls and construction aids.

11. Temporary utilities.


13. Check of required Bond and Insurance certifications.

14. Completion time for contract and liquidated damages.

15. Request for extension of contract time.

16. Request for a weekly job meeting for all involved.

17. Security Procedures


19. Guarantee on completed work.

20. Equipment to be used.

21. Staking of work.

22. Project inspection

23. Labor requirements.

24. Laboratory testing of material requirements.

25. Inventory of material stored on site provisions.


27. Posting of signs.

28. Pay request submittal dates.
29. Equal opportunity requirements.

1.03 PROGRESS MEETINGS

A. Schedule regular periodic meetings. The progress meetings will be held every thirty (30) days or less with the first meeting thirty (30) days after the preconstruction meeting or thirty (30) days or less after the date of Notice to Proceed.

B. Hold called meetings as required by progress of the work.

C. Location of the meetings: Project field office of Contractor.

D. Attendance:
   1. Engineer and his professional consultants as needed.
   2. Contractor
   3. Owner's representative
   4. Resident project representative
   5. Subcontractors as appropriate to the agenda.
   6. Suppliers as appropriate to the agenda.
   7. Others as appropriate.

E. Suggested Agenda:
   1. Review approval of minutes of previous meeting.
   2. Review of work progress since previous meeting.
   3. Field observations, problems, conflicts.
   4. Problems which impede Construction Schedule.
   5. Review of off-site fabrication, delivery schedules.
   6. Corrective measures and procedures to regain projected schedule.
   7. Revisions to Construction Schedule.
   8. Progress schedule during succeeding work period.
9. Coordination of schedules.

10. Review submittal schedules; expedite as required.


12. Pending changes and substitutions.

13. Review proposed changes for:
   a. Effect on Construction Schedule and on completion date.
   b. Effect on other contracts of the Project.

14. Other business.

15. Construction schedule.

16. Critical/long lead items.

F. The Contractor is to attend progress meetings and is to study previous meeting
   minutes and current agenda items to be prepared to discuss pertinent topics such
   as deliveries of materials and equipment, progress of the work, etc.

G. The Contractor is to provide a current submittal log at each progress meeting in
   accordance with Section 01340.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)
SECTION 01310  
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall develop a network plan demonstrating complete fulfillment of all contract requirements and shall utilize the Critical Path Method (hereinafter referred to as CPM) in planning, coordinating and performing the work under this contract (including all activities of subcontractors, equipment vendors and suppliers). The principles and definition CPM terms used herein shall be as set forth in the Associated General Contractors of America (AGC) publication, The Use of CPM in Construction, A Manual for General Contractors and the Construction Industry, Copyright 1976, but the provisions of this section shall govern the planning, coordinating and performance of the work.

1.02 ARROW DIAGRAM REQUIREMENTS

A. The arrow diagram shall show the sequence and interdependence of activities required for complete performance. In preparing the arrow diagram, the Contractor shall break up the work into activities of duration of no longer than fifteen working days each, except as to non-construction activities (such as procurement of materials, delivery of equipment and concrete curing) and any other activities for which the Engineer may approve the showing of longer duration. The diagram shall show not only the activities for actual construction work for each trade category of the project, but also such activities as the Contractor's work of submittal of shop drawings, equipment schedules, coordination drawings, templates, fabrication, delivery and the like, and Engineer's review and approval of shop drawings. Activities related to a specific physical area of the project shall be grouped on the diagram for ease of understanding and simplification. Activity duration (i.e. the single best estimate, considering the scope of the activity, and the resources planned for the activity) shall be shown on each activity on the diagram. To the extent that the arrow diagram or any revised arrow diagram shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been approved by the Engineer. Failure to include any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the Engineer's approval of arrow diagrams.

B. The arrow diagram shall include a cost estimate for each activity which cumulatively equals the total Contract cost. Estimated overhead and profit shall
be prorated throughout all activities. The partial payments, as defined under the General Conditions, will be based on these approved activity costs.

C. With each request for a partial payment, the Contractor shall submit a copy of the arrow diagram marked to show the activities completed and partially completed, for which payment is requested.

1.03 SUBMITTAL

A. Within ten calendar days after award of this contract, the Contractor shall submit, for the Engineer's review, an arrow diagram describing the activities to be accomplished and their dependency relationships, showing starting and completion dates for each activity in terms of the number of days after receipt of Notice to Proceed. All completion dates shown shall be within the period specified for contract completion.

B. Within ten calendar days after receipt of the initial arrow diagram, the Engineer shall meet with the Contractor for joint review, correction or adjustment of the proposed plan and schedule. Within five calendar days after the joint review, the Contractor shall revise the arrow diagram in accordance with agreements reached during the joint review and shall submit two copies of each of the revised arrow diagram to the Engineer. After the Contractor has received both the Notice to Proceed and the approved copy of the arrow diagram, he shall immediately add calendar dates to the arrow diagram in lieu of the number of days from the date of Notice to Proceed and shall furnish two copies of the revised arrow diagram to the Engineer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01340

SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall submit to the Engineer for review and exception, if any, such working drawings, shop drawings, test reports and data on materials and equipment (hereinafter in this article called data), and material samples (hereinafter in this article called samples) materials list, certificates and affidavits as are required for the proper control of work, including but not limited to those working drawings, shop drawings, data and samples for materials and equipment specified elsewhere in the Specifications and in the Contract Drawings.

2. Within thirty (30) calendar days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer a complete materials list of preliminary data on items for which Shop Drawings are to be submitted. Included in this materials list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way expressed or implied relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Specifications. This procedure is required in order to expedite final review of Shop Drawings.

3. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Authority and the Engineer. This log should include the following items:

   a. Submittal-Description and Number assigned.

   b. Date to Engineer.

   c. Date returned to Contractor (from Engineer).

   d. Status of Submittal (Reviewed No Comments, Reviewed Comments as Noted, Rejected, Revise and Resubmit, and Not Reviewed).

   e. Date of Resubmittal and Return (as applicable).

   f. Date material release (for fabrication).
g. Projected date of fabrication.

h. Projected date of delivery to site.

i. Specification Section.

j. Drawings Sheet Number.

B. Related Requirements Described Elsewhere:


2. Project Record Documents: Section 01720.

1.02 CONTRACTOR'S RESPONSIBILITY

A. It is the duty of the Contractor to check all drawings, data and samples prepared by or for him before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents. If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer.

B. Determine and verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Conformance with Specifications.

C. The Contractor shall furnish the Engineer a schedule of Shop Drawings submittals fixing the respective dates for the submission of shop and working drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment. This schedule shall indicate those that are critical to the progress schedule.
D. The Contractor shall not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with approval.

E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than thirty (30) calendar days for checking and appropriate action from the time the Engineer receives them.

F. All submittals shall be accompanied with a transmittal letter prepared in duplicate containing the following information:

1. Shop Drawing cover page (see Contract Forms: Section 00830).
2. Date.
3. Project Title and Number.
4. Contractor's name and address.
5. The number of each Shop Drawings, Project Data, and Sample submitted.
7. Submittal Log Number conforming to Specification Section Numbers.

G. The Contractor shall submit four (4) copies of descriptive or product data submittals to complement shop drawings for the Engineer plus the number of copies which the Contractor requires returned. The Engineer will retain four (4) sets. All blueprint shop drawings shall be submitted with one (1) set of mylar reproducible and four (4) sets of prints. The Engineer will review the blueprints and return to the Contractor the set of marked-up mylar reproducible with appropriate review comments. All shop drawings, when practical, shall be 24-inch by 36-inch in size.

H. The Contractor shall be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by Engineer of the necessary Shop Drawings.

I. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposed to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of drawings and specifications.
1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS

A. The Engineer's review of drawings, data and samples submitted by the Contractor will cover only general conformity to the Specifications, external connections, and dimensions which affect the installation. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, quantities, and details of the material, equipment, device, or item shown.

B. The review of drawings and schedules will be general, and shall not be construed:
   1. as permitting any departure from the Contract requirements;
   2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
   3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.

C. If the drawings or schedules as submitted describe variations per paragraph 1.04.E., and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the reviewed drawings without noting an exception.

D. When reviewed by the Engineer, each of the Shop Drawings will be identified as having received such review being so stamped and dated. Shop Drawings stamped "REVISE AND RESUBMIT" and with required corrections shown will be returned to the Contractor for correction and resubmittal.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.

F. If the Contractor considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.

G. Shop drawings and submittal data shall be reviewed by the Engineer for each original submittal and first and second resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor in accordance with the terms of the Engineer's Agreement with the OWNER.

H. When the Shop Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall
I. Partial submittals will be reviewed. Submittals not complete will be returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:

2. Processes.
3. As indicated in specific specifications sections.

All drawings, schematics, manufacturer's product data, certifications and other shop drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interface checking.

1.04 SHOP DRAWINGS

A. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop Drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data, shall be considered only as supportive to required Shop Drawings as defined above. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements.

B. Manufacturer's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.

C. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

D. Each Shop Drawing shall have a blank area 3-1/2 inches by 3-1/2 inches, located adjacent to the title block. The title block shall display the following:

1. Project Title and Number.
2. Name of project building or structure.

3. Number and title of the shop drawing.

4. Date of shop drawing or revision.

5. Name of contractor and subcontractor submitting drawing.

6. Supplier/manufacturer.

7. Separate detailer when pertinent.

8. Specification title and number.


10. Application Contract Drawing Number.

E. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the work in accordance with the Contract, even though such drawings have been reviewed.

F. Data on materials and equipment include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

G. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.

H. All manufacturers or equipment suppliers who proposed to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least one (1) year.

I. Only the Engineer will utilize the color "red" in marking Shop Drawing submittals.
1.05  WORKING DRAWINGS

A. When used in the Contract Documents, the term "working drawings" shall be considered to mean the Contractor's plan for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework; for underpinning; and for such other work as may be required for construction but does not become an integral part of the Project.

B. Copies of working drawings as noted in paragraph 1.05 A. above, shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer, and shall be submitted at least thirty (30) calendar days (unless otherwise specified by the Engineer) in advance of their being required for work.

C. Working drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of North Carolina and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the Engineer, which review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks of error are assumed by the Contractor; the Owner and Engineer shall have no responsibility therefor.

1.06  SAMPLES

A. The Contractor shall furnish, for review by the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until accepted by the Engineer.

B. 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.

3. A minimum of two samples of each item shall be submitted.

C. Each sample shall have a label indicating:

1. Name of project.
2. Name of Contractor and Subcontractor.

3. Material or equipment represented.

4. Place of origin.

5. Name of producer and brand (if any).

6. Location in project.

(Samples of finished materials shall have additional marking that will identify them under the finished schedules).

D. The Contractor shall prepare a transmittal letter in triplicate for each shipment of samples containing the information required in paragraph 1.06 C. above. He shall enclose a copy of this letter with the shipment and send a copy of this letter to the Engineer. Review of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

E. Accepted samples not destroyed in testing shall be sent to the Engineer or stored at the site of the work. Accepted samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the accepted samples. Samples which failed testing or were not accepted will be returned to the Contractor at his expense, if so requested at time of submission.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Submit to the Engineer a Schedule of Values allocated to the various lump sum portions of the Work at the Pre-Construction Conference and in accordance with the successful bidder's bid schedule/cost estimating worksheet. Add Alternate items, whether lump sum or unit cost, will be included in the schedule if added to the contract.

B. Upon request of the Engineer, support the values with data which will substantiate their correctness.

C. The Schedule of Values unless objected to by the Engineer, shall be used only as the basis for the Contractor's Applications for Payment.

1.02 RELATED REQUIREMENTS

A. General Conditions and Requirements of the Contract

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Type schedule on an 8-1/2” x 11” or 8-1/2” by 14” white paper; Contractor's standard forms and computer printout will be considered for approval by the Engineer upon Contractor's request. Identify schedule with:

1. Title of project and location

2. Owner and purchase order number

3. Engineer and project number

4. Name and address of Contractor

5. Contract designation

6. Date of submission

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing unit values for progress payments during construction.
C. Identify each line item with the number and title of the respective major section of the specifications.

D. For each line item which has installed value of more than $50,000, breakdown costs to list major products or operations under each item.

E. For the various portions of the Work:

1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.

2. Total installed cost, with overhead and profit

F. Round off figures to nearest dollar

G. Make sum of total costs of all items listed in schedule equal to total Contract Sum.

1.04 PREPARING SCHEDULE OF UNIT MATERIAL VALUES

A. Submit a separate schedule of unit prices for materials to be stored on which progress payment will be made.

B. Make form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.

C. Include in unit prices only:

1. Cost of the material

2. Delivery and unloading at site

3. Sales taxes

D. Make sure that unit prices multiplied by quantities given, equal material cost of that item in Schedule of Values.

1.05 REVIEW AND RESUBMITTAL

A. After review by Owner, revise and resubmit Schedule of Values and Schedule of Material Values as required.

B. Resubmit revised Schedules in same manner
PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION
SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 TESTS

A. The OWNER will provide for payment for all required tests including initial testing for the conformance testing, except those proving satisfactory operation of equipment, pressure leakage tests and disinfection. Generally, tests will be compaction and density tests, soil thickness, stone quality tests, liner quality control, and liner integrity tests. On pipe, the manufacturer's or supplier's certificate that the material meets the requirements of the specification will be accepted subject to verification by the OWNER'S ENGINEER. Any and all tests which have to be repeated because of the failure of the tested material to meet specifications shall be paid for by the Contractor and the costs of any such tests shall be deducted from payments due the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01510
TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. Field Offices
B. Contractor Storage Area
C. Power Services
D. Water Services
E. Telephone Services
F. Sanitary Facilities
G. Maintenance of Traffic
H. Barricades and Lights
I. Fences
J. Damage to Existing Property
K. Security
L. Access Roads
M. Drainage
N. Erosion and Siltation Control Measures
O. Parking
P. Emergencies
Q. Petroleum Spill/Leak Containment
R. Waste Construction Materials

1.02 FIELD OFFICES

A. The Contractor shall, prior to the first application for payment, erect temporary field offices only within the Limits of Construction shown on the Drawings or as otherwise approved by the Owner.

B. During the performance of this Contract, Contractor shall maintain a suitable office at the site of the work which shall be the headquarters of his representative authorized to receive drawings, instruction, or other communication or articles. Any communication given to the said representative or delivered at Contractor's
office at the site of the work in his absence shall be deemed to have been delivered to Contractor.

C. Copies of the Drawings, Specifications, and other Contract Documents shall be kept at Contractor's office at the site of the work and available for use by the Owner, Engineer, or Contractor at all times.

D. In addition, Contractor shall furnish and maintain temporary field offices for the Engineer at designated locations at the site. The field office shall be a portable frame building or office trailer, as approved, and shall provide not less than 400 square feet of interior floor space with an enclosed office room and one room with 150 square feet. The office shall be watertight and weatherproof, shall have screened windows and solid door with a lock and six keys. The office shall be provided with electrical and telephone services (as specified below), for the duration of the Contract, shall have the necessary equipment adequate to maintain a temperature of 72 degrees F (+3 C) under all conditions, and shall be provided with janitor and maintenance service. The Contractor shall provide sanitary facilities, hot and cold water, toilet paper, towels, soap and a water cooler with bottled drinking water (with adequate supplies maintained during the construction period). The office shall have linoleum or tile on the floor and shall be furnished with:

2 - 30-inch by 60-inch desk with drawers and chair
3 - 36-inch by 72-inch tables
1 - 42-inch by 72-inch drafting table with stool
1 - 4-drawer legal size cabinets with lock and 2 sets of keys. Cabinets shall be fire resistant, meeting with the requirements for "Filing Devices, Insulated (36E9) Class D Label" of UL Specifications
8 - office chairs
1 - 7-foot 3-inch by 3-foot steel utility shelving assembled, as provided
1 - metal plan rack (12 plans each) with bookshelf
1 - 4-foot by 6-foot bulletin board, mounted.
1 - clothes rack
1 - first aid kit
2 - fire extinguishers, non-toxic, dry chemical, meeting UL for Class A, B, & C fires
3 - Steel wastepaper baskets
2 - Telephones (one incoming line), one in each office area.
1 - Plain paper fax machine with separate telephone line
1 - Telephone answering machine
1 - Bottled water dispenser with refrigerator
1 - Photocopy machine with shrink and enlarge capabilities
1.03 CONTRACTOR STORAGE AREA

A. A storage area will be provided on the project site for use by the Contractor for storage of his materials, tools, equipment, office and other items necessary for construction. The exact limits of the storage area will be designated in the field by the Owner/Engineer. The Contractor shall be fully responsible for the security of this area, including fencing, watchmen, and other means of security. Under no circumstances will the Owner be responsible for the security of any property belonging to the Contractor, his subcontractors, or any of his work forces.

B. The Contractor shall consult with the Owner as to the best location for setting up construction plant buildings and related facilities so as to expedite the Work.

1.04 POWER SERVICES

A. Contractor shall provide all temporary power for heating, cooling, and lighting until the work is accepted. It is Contractor's responsibility to make any connections necessary to perform work or furnish services related to this Contract. A separate temporary meter shall be installed by the local utility to measure electricity usage by Contractor. Contractor shall make all necessary arrangements with the local utility for these services. Contractor shall pay for all electricity usage by the Engineer and Contractor.

1.05 WATER SERVICES

A. Water in sufficient amounts for proper completion of the Work shall be furnished by Contractor without charge to Owner. Contractor shall furnish necessary equipment, pipe, hose, nozzles and tools and shall perform all necessary labor. If an existing water hydrant is used, the use of a water meter on hydrant will be required. Arrangements of such use with the OWNER will be necessary.

1.06 TELEPHONE SERVICES

A. Contractor shall make all necessary arrangements with the telephone utility for telephones in his offices at the site and a separate telephone line in the field office of the Engineer (also to be used for fax machine) and shall pay all charges from the office of the Engineer.

B. Subcontractors and others performing work or furnishing services at the site shall be permitted to use Contractor's telephone without charge for toll-free calls pertaining to the Work.
1.07 SANITARY FACILITIES

A. Contractor shall furnish temporary sanitary facilities at the sites, as provided herein, for the needs of all construction workers and others performing work or furnishing services in connection with this Contract.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 10 personnel. Contractor shall enforce the use of such sanitary facilities by all personnel at the site. The use of existing toilet facilities at the landfill by Contractor's personnel is strictly forbidden.

1.08 MAINTENANCE OF TRAFFIC

A. Contractor shall conduct his work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways and walks, Contractor shall obtain prior permission from the Owner to obstruct traffic at the designated point.

B. In making open cut street crossing, Contractor shall not block more than one-half of the street at a time.

1.09 BARRICADES AND LIGHTS

A. All roads which are closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs.

B. All open trenches and other excavations shall have suitable barricades and signs to provide adequate protection to the public. Obstructions, such as material piles and equipment shall be provided with similar warning signs.

C. All barricades, signs, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements.

1.10 FENCES

A. All existing fences affected by the work shall be maintained by Contractor until completion of the work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence and the period the fence may be left relocated or dismantled has been agreed upon.

B. On completion of the work, Contractor shall restore all fences to their original or to a better condition and to their original location.
1.11 DAMAGE TO EXISTING PROPERTY

A. Contractor will be held responsible for any damage to existing structures including the landfill gas collection system, work, materials or equipment because of his operations and shall repair or replace any damaged structures, work, materials or equipment to the satisfaction of, and at no additional cost to the Owner.

B. Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.

C. Contractor shall be responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches, embankments, culverts, bridges or other public or private property, which may be caused by transporting equipment, materials, or personnel to or from the work. Contractor shall make satisfactory and acceptable arrangements with the agency having jurisdiction over the damaged property concerning its repair or replacement.

1.12 SECURITY

A. Contractor shall be responsible for protection of the site, and all work, materials, equipment and existing facilities thereon, against vandals and other unauthorized persons.

B. No claim shall be made against Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to Owner's property resulting from his failure to provide security measures as specified.

C. Security measures shall be at least equal to those usually provided by Owner to protect his existing facilities during normal operation, but shall also include such addition security fencing, barricades, lighting and other measures as required to protect the site.

1.13 ACCESS ROADS

A. Contractor shall construct, grade, stabilize and maintain temporary access roads to various parts of the site as required to complete the project.

1.14 DRAINAGE

A. The contractor shall keep all natural drainage and water courses unobstructed or provide equal courses effectively placed, and prevent accumulations of surface water.
1.15 EROSION AND SILTATION CONTROL MEASURES

A. Adequate control of erosion and siltation of both a temporary and permanent nature on areas disturbed by this work shall be provided under this Contract, subject to the acceptance of the Engineer. There will be a joint on-site inspection prior to commencing work, with Contractor, State and County Officials and the Engineer to determine specific siltation control requirements.

B. Erosion control shall comply with all applicable State and County Regulations.

1.16 PARKING

A. Contractor shall provide and maintain suitable parking areas for the use of all construction workers and other performing work by furnishing services in connection with the project, as required to avoid any need for parking personnel vehicles where they may interfere with public traffic, Owner's operations, or construction activities.

1.17 EMERGENCIES

A. The Contractor shall display and update phone numbers of the local police, fire department, hospital, and emergency squad at all times and at all phones on site during the project.

1.18 PETROLEUM SPILL/LEAK CONTAINMENT

A. Contractor shall provide a spill/leak containment vessel for all petroleum storage tanks. The containment vessels shall have a capacity exceeding 125 percent, or more if required under current regulation, of the volume of the petroleum storage tank for which they are intended.

B. For earthen berm'd containment vessel, the berm and floor of the containment area shall be lined with a plastic sheet type lining material that is watertight and capable of withstanding contact with the petroleum products stored in the area for the duration of the project, or until spill accumulation is removed. The petroleum storage tank, when placed in this area, shall not damage or puncture the plastic lining.

C. For concrete containment vessels, the concrete shall be air-entrained with a minimum of 4,000 psi compressive strength when delivered. Reinforced steel shall be Grade 40 with No. 4 bars on 12-inch centers each way.

Anchor bolts must be furnished to tie-down the petroleum storage tank to prevent the flotation of an empty tank due to rain water.
D. The containment vessel must contain an acceptable means of removing rain water or recovering spilled or leaked petroleum from the vessel. If a siphon arrangement is used, it shall be mounted on the wall of the vessel or other accessible means and must automatically break when the vessel empties. Then, the siphon must be manually primed the next time the contents are discharged.

1.19 WASTE CONSTRUCTION MATERIALS

A. The Contractor shall dispose of all waste construction material at a permitted waste facility. All associated cost for disposal shall be the Contractors.

B. Waste construction material, which is accepted at the Owner's facility, may be disposed of in the Owner's facility.

C. Waste construction materials shall be less than 4-feet in length.

D. Waste construction materials disposed at the Owner's waste facility shall not be subject to tipping fees.

E. The Contractor shall provide sufficient containers to collect and hold waste construction materials. Waste materials shall be collected on a daily basis.

F. The Contractor shall dispose of waste construction material when containers are full. Transportation of the waste containers will be supplied by the Contractor.

G. The waste containers shall be transported, by the Contractor, to the scalehouse to be weighed prior to disposal. The waste containers shall be transported, by the Contractor, to disposal areas designated by the Owner.

END OF SECTION
SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. General provisions of Contract, including General and Supplementary Conditions.

B. Division 1 through Division 16 Specification Sections.

1.02 SECTION INCLUDES

A. Administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Administrative and procedural requirements for handling requests for substitutions.

C. Requirements for product list submittal.

1.03 SUBSTITUTION REQUESTS

A. Submit a separate request for each proposed substitution; original signature sets in accordance with Shop Drawings: Section 01340, each on form bound into Project Manual. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

1. Designate Specification Section and Article number.

2. Identify manufacturer by name and address, trade name, model number or catalog number.


4. Give itemized comparison of qualities of proposed substitution with specified product, changes required in other elements of the Work due to substitution and effect on Progress Schedule.

5. Give name and address of similar projects on which product was used and date of installation.

6. Provide cost data comparing proposed substitution with specified product and state the amount of net change to Contract Price.
B. During Bidding period, times for submittal of substitution requests are stated in the Instructions to Bidders.

C. After Bidding period, up to thirty (30) days after date of Notice to Proceed, Engineer will consider written requests from Contractor for proposed substitutions of products. Subsequent requests will be considered only in case of product unavailability or other condition beyond control of the Contractor.

D. Do not order or install substitute products without written acceptance from the Engineer. Do not imply or indicate substitutions on Shop Drawings or product data submittals without a separate formal request.

E. Engineer will determine acceptability of substitution. The burden of proof of acceptability of a proposed substitution is upon the Contractor; information submitted must convince the reviewers that characteristics of the proposed substitution are equal to or better than those of the specified product. Only one request for substitution for each product will be considered. If not accepted, Contractor shall provide specified product.

F. Request for substitution constitutes a representation that the Contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to the specified product.

2. Will provide same or greater warranties for proposed product as for the specified product.

3. Will coordinate installation of substitution accepted into the Work and make other changes and adjustments as may be required to make the Work complete in all respects.

4. Waives all claims for additional costs due to substitution which may later become apparent.

5. Agrees to reimburse the Owner for the additional service charges of the Engineer and their Consultants for evaluation and review of the proposed substitution.

1.04 PRODUCT LIST

A. Prepare the product listing schedule with information on each item tabulated under the following column headings:

1. Related Specification Section number.

2. Generic name used in Contract Documents.
3. Proprietary name, model number and similar designations.

4. Manufacturer's and name and address.

5. Supplier's name and address.

6. Installer's name and address.

7. Projected delivery date, or time span of delivery period.

B. Within fifteen (15) days after date of Notice to Proceed, submit five (5) copies of product list schedule. Provide a written explanation for omissions of data, and for known variations from Contract requirements.

C. The Engineer will respond in writing to the Contractor, within a reasonable period based upon review requirements, of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents.

1.05 QUALITY ASSURANCE

A. To the fullest extent possible, provide products of the same kind, from a single source.

B. When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

   a. Name of product and manufacturer.

   b. Model and serial number.
c. Capacity.

d. Speed.

e. Ratings.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

B. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

C. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

D. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

E. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

F. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

A. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Where available, provide standard products, which meet the specified requirements, of types that have been produced and used successfully in similar situations on other projects.

B. Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:

1. Where only a single source product or manufacturer is named, provide the product indicated or submit a request for substitution for any product or manufacturer not named.

2. Where two (2) or more sources of products or manufacturers are named, provide one (1) of the products indicated or submit a request for substitution for any product or manufacturer not named.

3. Where Specifications describe a product or assembly, listing exact characteristics required, without use of a brand or trade name, provide any product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Where Specifications require compliance with performance requirements, provide any products that comply with the specified requirements.

5. Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

6. Where Specifications require matching an established Sample, the Engineer's decision will be final on whether a proposed product matches satisfactorily.

7. Where specified product requirements are indicated to be selected from manufacturer's standard colors, patterns, textures, or similar condition, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color, pattern and texture from the product line selected.

8. The description of specific qualities takes precedence over specified reference standards. The description of specific qualities and specified reference standards together take precedence over the named products of designated manufacturers.
C. Source Manufacturers:

1. Primary source products and manufacturers named in a Specification section are listed as standards of quality to which other products will be compared.

2. Additional source manufacturers named in a specification are those manufacturers considered by the Engineer as generally capable of manufacturing products which may conform to the specified requirements. However, their being listed does not guarantee or imply that any or all of their products will be considered as equal to the specified requirements.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTALLATION INSTRUCTIONS

A. When Contract Documents require installation of Work to comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including copies to the Engineer.

B. Handle, install, connect, condition, clean, and adjust products in accordance with such instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, notify Engineer for additional instructions.

C. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by Contract Documents.

D. Do not proceed with work without clear instructions.
SUBSTITUTION REQUEST

PROJECT: __________________________ DATE: __________________________

TO: SCS ENGINEERS
    4041 Park Oaks Blvd.
    Suite 100
    Tampa FL 33610

FROM: __CONTRACTOR __BIDDER __SUPPLIER __MANUFACTURER

HEREBY REQUESTS ACCEPTANCE OF THE FOLLOWING PRODUCT OR SYSTEMS AS A
SUBSTITUTION IN ACCORD WITH PROVISIONS OF DIVISION ONE OF THE
SPECIFICATIONS:

1. SPECIFIED PRODUCT OR SYSTEM:
   Generic Description: ___________ Specification Section No. ______ Art. ___ Para._

2. SUPPORTING DATA:
   ___Product data for proposed substitution is attached (description of product, reference standards,
   performance and test data).
   ___Sample attached. ___Sample will be sent if requested.

3. PRODUCT OR SYSTEM QUALITY COMPARISON:

<table>
<thead>
<tr>
<th>Specified Product</th>
<th>Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name, brand:</td>
<td></td>
</tr>
<tr>
<td>Catalog No.:</td>
<td></td>
</tr>
<tr>
<td>Manufacturer:</td>
<td></td>
</tr>
<tr>
<td>Vendor:</td>
<td></td>
</tr>
<tr>
<td>Significant variations:</td>
<td></td>
</tr>
</tbody>
</table>

   Maintenance Service Available Locally: ___Yes ___No

   Spare Parts Source: ________________________________

4. EFFECT OF SUBSTITUTION:
   Affects other parts of work: __No__Yes
   Explain: ___________________________
   Substitution changes Contract Time: Add/Deduct ___days.
   Saving or credit to Owner if accepted: $ ____________.
   Extra cost to Owner if accepted: $ ____________.

5. PREVIOUS INSTALLATIONS:
   Attach list of local similar projects on which proposed substitution was used and dates of
   installations.

6. STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT
   REQUIREMENT: I/we have investigated the proposed substitution and:

New Hanover County Secure Landfill
Cells 7-13 Expansion Project

Material and Equipment
01600 - 7
June 2017
a. believe that it is equal or superior in all respects to specified product, except as stated above; and
b. will provide the same warranty as specified for specified product; and
c. have included complete cost data and implications of the substitution; and
d. will pay redesign and special inspection costs caused by the use of this product; and
e. will pay additional costs to other contractors caused by the substitution; and
f. will coordinate the incorporation of the proposed substitution in the Work; and
g. will modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning; and
h. waive future claims for added cost to Contract caused by the substitution; and
i. agree to pay to the Owner or Engineer the hourly rate of One Hundred Fifteen Dollars ($115.00) per hour for cost of Engineer to evaluate and review the proposed substitution.

Name and Title: ___________________________ Date ____________

Signature: __________________________________________

ENGINEER'S REVIEW AND ACTION:

Substitution not accepted:
Substitution is accepted:
Substitution is accepted, with the following comments:

By: ___________________________ Date: ____________

OWNER'S Acceptance:

Substitution is accepted.
Substitution is accepted, with the following comments:

By: ___________________________ Date: ____________

END OF SECTION
SECTION 01650

START-UP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Provide material, personnel, and equipment as needed and as
specified herein to perform the required start-up and demonstration tests.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PRELIMINARY MATTERS AND FIELD TESTS

A. Start-up Certification: Prior to system start-up, successfully complete all the field
testing required of the individual components of the work. Submit six (6) copies
of CHECK-OUT MEMO's for each individual component, signed by Contractor,
Subcontractor and the manufacturer's representative. A sample CHECK-OUT
MEMO form is provided at the end of this section. All copies shall be provided
with the respective copies of the Operation and Maintenance Manual. This form
shall be completed and submitted before Instruction in Operation to Owner or a
request for initiating any final inspection(s).

B. Demonstrate to the Owner's Representative that all temporary jumpers and/or
bypass have been removed and that all of the components are operating under
their own controls as designated.

C. Coordinate start-up activities with the Owner's Representative and with the
Engineer prior to commencing system start-up.

3.02 START-UP TESTS

A. Confirm that all equipment is properly energized, that the valves are set to their
normal operating condition and that the flow path through the new work is
unobstructed.

B. Slowly fill each hydrostatic structure in the process flow stream with water.

C. Initiate start-up and training in accordance with and with the use of the plant
operation and maintenance manuals.

D. Observe the component operation and make adjustments as necessary to optimize
the performance of the Work.
E. The start-up tests will be conducted for seven consecutive days. The Work must operate successfully during the seven-day testing period in the manner intended. If the Work does not operate successfully, or if the start-up is interrupted due to problems, the problems will be corrected and the test will start over from day one. During the start-up tests, instruct designated plant operating personnel in the function and operation of the Work.

F. Coordinate with Owner for any adjustments desired or operational problems requiring debugging.

G. Make adjustments as necessary.

3.03 DEMONSTRATION TESTS

A. After all Work components have been constructed, field tested and started-up in accordance with the individual specifications and manufacturer requirements, perform the Demonstration Tests in the presence of the Engineer and the Owner. The demonstration shall be held upon completion of all systems at a date to be agreed upon in writing by the Owner or his representative.

B. During the demonstration test, operate the Work and cause various operational circumstances to occur. As a minimum, these circumstances will include average and peak flows, random equipment or process failures, tank overflows, surcharges and interlocks. Demonstrate the essential features of the equipment and its relationship to other equipment. Prior to the demonstration test, the Contractor shall submit two (2) copies of a detailed schedule of operational circumstances to describe the proposed test procedures for approval of completeness. These approved procedures will then be used as the agenda at the demonstration. Coordination of the test schedule will be accomplished through the Engineer.

C. The demonstration test procedures shall follow the example test procedure form provided at the end of this section. Provide similar test procedure forms for each section of the work to cover all aspects and features specified.

D. Acceptability of the Work's performance will be based on the Work performing as specified, under these actual and simulated operating conditions as defined in the Contract Documents. The intent of the demonstration tests is for the Contractor to demonstrate to the Owner and the Engineer that the Work will function as a complete and operable system under normal as well as emergency operating conditions and is ready for acceptance.

E. Demonstrate the essential features of the whole system as it applies to the Work, including the mechanical equipment, piping, structures, finishes, controls, instrumentation, power distribution and lighting systems. Use the approved procedures and circumstances to demonstrate the system. Any minor deficiencies found shall be noted and included on a punch list attached to the Certificate of Completed Demonstration. The system shall be demonstrated only once, after
completion of start-up tests. If circumstances arise that interrupt the test procedures (such as weather, unforeseen process problems, or problems caused by the Contractor whether or not the problems are the fault of the Contractor, etc.), then the test shall be terminated and rescheduled to a later date after the problem is corrected. The test shall be run in its entirety if so directed by the Engineer.

F. Certificate of Completed Demonstration: Submit six (6) copies of the CERTIFICATE OF COMPLETED DEMONSTRATION for the work, signed by the Contractor, Subcontractor, Engineer, and Owner and insert one copy in each Operation and Maintenance Manual. A sample CERTIFICATE OF COMPLETED DEMONSTRATION form is provided at the end of this section.
MANUFACTURER'S CHECK-OUT CERTIFICATION

OWNER: ____________________________  No. Copies 5  
ENGINEER: SCS Engineers  No. Copies 1  
ARCHITECT: ____________________________  No. Copies Check-out  
CONTRACTOR: ____________________________  No. Copies Memo No.  
FIELD: ____________________________  
OWNER: ____________________________  

PROJECT DATA

Name: ____________________________  
Number: ____________________________  
Location: ____________________________  
Drawing No.: ____________________________  
Owner: ____________________________  
Specification Section: ____________________________  
Other: ____________________________  

Name of Equipment Checked: ____________________________  
Name of Manufacturer of Equipment: ____________________________  

1. The equipment furnished by us has been checked on the job by us. We have reviewed (where applicable) the performance verification information submitted to us by the Contractor.
2. The equipment is properly installed, except for items noted below.*
3. The equipment is operating satisfactorily, except for items noted below.*
4. The written operating and maintenance information (where applicable) has been presented to the Contractor, and gone over with him in detail. Five (5) copies of all applicable operating and maintenance information and parts lists have been furnished to him for insertion in each of the Operation and Maintenance Manuals.

Checked By: ____________________________  
Name of Manufacturer's Rep.  Name of General Contractor  
Address and Phone No. of Rep.  Authorized Signature/Title/Date  
Signature/Title/Person Making Check  Name of Subcontractor  
Date Checked  Authorized Signature/Title/Date  

* Manufacturer's Representative Notations: Exception noted at time of check were:

New Hanover County Secure Landfill  
Cells 7-13 Expansion Project  
01650 - 4  
Start-Up  
June 2017
Manufacturer's Representative to note any limitation on adequacy of related equipment that directly affects operation, performance or function of equipment checked. (No comment presented herein will indicate complete adequacy of related systems or equipment):
DEMONSTRATION TEST PROCEDURES (SAMPLE)

<table>
<thead>
<tr>
<th>TEST DESCRIPTION:</th>
<th>SHEET: __ OF __</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pump Capacity Verification</td>
<td>DATE VERIFIED BY</td>
</tr>
<tr>
<td>A. Shutoff Head - Record pressure of each pump under dead head conditions (pump against closed valve).</td>
<td></td>
</tr>
<tr>
<td>Pump 1        psig (actual)     psig (expected)</td>
<td></td>
</tr>
<tr>
<td>Pump 2        psig (actual)     psig (expected)</td>
<td></td>
</tr>
<tr>
<td>B. Pump-down test for each pump from wetwell with valve open. Ten-minute runs at steady pressure after flow has been fully establish.</td>
<td></td>
</tr>
<tr>
<td>Pump 1        gpm (calculated)  psig  gpm (from cert. curve @ above pressure)</td>
<td></td>
</tr>
<tr>
<td>Pump 2        gpm (calculated)  psig  gpm (from cert. curve @ above pressure)</td>
<td></td>
</tr>
<tr>
<td>C. Flowmeter verification</td>
<td></td>
</tr>
<tr>
<td>___ gpm (calculated)</td>
<td>___ gpm (reading)</td>
</tr>
<tr>
<td>D. Pump valve operation observed</td>
<td></td>
</tr>
<tr>
<td>E. Pump control functions observed:</td>
<td></td>
</tr>
<tr>
<td>1. Hand mode</td>
<td></td>
</tr>
<tr>
<td>2. Auto mode (level control)</td>
<td></td>
</tr>
</tbody>
</table>

CERTIFICATE OF COMPLETED DEMONSTRATION

New Hanover County Secure Landfill
Cells 7-13 Expansion Project
Start-Up
01650 - 6
June 2017
**NOTE TO CONTRACTOR:**
Submit five (5) copies of all information listed below for checking in order to receive approval at least one week before scheduled demonstration of the Work. After all information has been approved by the Engineer, give the Owner a Demonstration of Completed Systems as specified and have the Owner sign five copies of this form. After this has been done, a written request for a final inspection of the system shall be made.

**MEMORANDUM:**
This certificate is for the information of all concerned that the Owner has been given a Demonstration of Completed Systems on the work covered under this Specification Section. This conference consisted of the system operation, a tour on which all major items of equipment were explained and demonstrated, and the following items were given to the Owner:

(a) Owner's copy of Operation and Maintenance Manual for equipment or systems specified under this section containing approved submittal sheets on all items, including the following:
   (1) Maintenance information published by manufacturer on equipment items.
   (2) Printed warranties by manufacturers on equipment items.
   (3) Performance verification information as recorded by the Contractor.
   (4) Check-out Memo's on equipment by manufacturer's representative.
   (5) Written operating instructions on any specialized items.
   (6) Explanation of guarantees and warranties on the system.

(b) Prints showing actual "As-Built" conditions.

---

**PROJECT DATA**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Number:</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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</tbody>
</table>

**CONTRACT DATA**

<table>
<thead>
<tr>
<th>Location:</th>
<th>Drawing No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner:</th>
<th>Specification Section:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
(c) A demonstration of the System in Operation and of the maintenance procedures which will be required. Minor deficiencies to be corrected which were noted in the demonstration are attached, along with a copy of the actual test procedures performed.

_____________________________________________________
(Name of Contractor)

By: _____________________________________________________
(Authorized Signature, Title & Date)

_____________________________________________________
(Name of Subcontractor)

By: _____________________________________________________
(Authorized Signature, Title & Date)

Operations and Maintenance Manual, Instruction Prints, Demonstration & Instruction in Operation Received:

_____________________________________________________
(Name of Owner)

By: _____________________________________________________
(Authorized Signature, Title & Date)

By: _____________________________________________________
(Authorized Signature, Title & Date)

END OF SECTION
SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Comply with requirements stated in Conditions of the Contract and in specifications for administrative procedures in closing out the Work.

B. Related Work Described Elsewhere:

1. Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

2. Project Record Documents: Section 01720

3. The respective sections of specifications: Closeout Submittals Required of Trades.

1.02 SUBSTANTIAL COMPLETION (BENEFICIAL OCCUPANCY)

A. When Contractor considers the Work as substantially complete, he shall submit to ENGINEER:

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, ENGINEER shall make an inspection to determine the status of completion.

C. Should ENGINEER determine that the Work is not substantially complete:

1. The ENGINEER will promptly notify Contractor in writing, giving the reasons therefore

2. Contractor shall remedy the deficiencies in the Work and send a second written notice of substantial completion to ENGINEER.

3. ENGINEER will re-inspect the Work.

D. When ENGINEER finds that the Work is substantially complete, he will:
1. Prepare and deliver to OWNER a tentative Certificate of Substantial Completion on form provided herein, with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any objections made by OWNER as provided in Conditions of the Contract, and when ENGINEER considers Work substantially complete, he will execute and deliver to OWNER and Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

### 1.03 FINAL INSPECTION

A. When Contractor considers the Work is complete, he shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Work is completed and ready for final inspection.

B. The ENGINEER will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should ENGINEER consider that the Work is incomplete or defective:

1. ENGINEER will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to ENGINEER that the Work is complete.

3. The ENGINEER will reinspect the Work.

D. When the ENGINEER finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

### 1.04 REINSPECTION FEES

A. Should the ENGINEER perform re-inspections due to failure of the Work to comply with the claims of status of completion made by Contractor:

1. OWNER will compensate the Engineer for such additional services.
2. OWNER will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Project Record Documents: To requirements of Section 01720.

C. Evidence of Payment and Release of Liens: To requirements of General and Special Conditions.

D. Certificate of Insurance for Products and Completed Operations.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the ENGINEER.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:
   a. Previous change orders or written amendment.
   b. Allowances
   c. Unit prices
   d. Deductions for uncorrected work
   e. Penalties and bonuses
   f. Deductions for liquidated damages
   g. Deductions for reinspection payments
   h. Other adjustments

3. Total Contract Sum, as adjusted.

4. Previous payments.

5. Sum remaining due.
C. ENGINEER will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain at the site for the Owner one record copy of:

1. Drawings
2. Specifications
3. Addenda
4. Change Orders and other modifications of the contract.
5. Engineer's Field Orders or written instructions.
6. Approved Shop Drawings, Working Drawings and Samples.
7. Field Test records.
8. Construction photographs.

B. Related Requirements Described Elsewhere:

1. Field Engineering And Survey: Section 01050
2. Shop Drawings, Working Drawings, And Samples: Section 01340
3. Suggested Construction Sequencing: Section 01900

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI format with section numbers as provided herein.
C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by the Engineer.

E. As a prerequisite for monthly progress payments, the Contractor is to exhibit the currently updated "Record Documents" for review by the Engineer and Owner.

1.03 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress.

1. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:

1. Depths of various elements of foundation in relation to finish first floor datum.

2. All underground piping with elevations and dimensions. Change to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made by Field Order or by Change Order.

6. Details not on original contract drawings.

7. Structure and piping relocations.

D. Specifications and Addenda: Legibly mark each section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
2. Changes made by Field Order or by Change Order.

E. Shop Drawings (after final review and approval): Provide five (5) sets of record drawings for each process equipment, piping, electrical system and instrumentation system.

1.05 SUBMITTAL

A. At Contract closeout, deliver Record Documents to the Engineer for the Owner.

B. Accompany submittal with transmittal letter in duplicate, containing:

1. Date

2. Project title and number

3. Contractor's name and address

4. Title and number of each Record Document

5. Signature of Contractor or his authorized representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:
   1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
   2. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
   3. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Documents Described Elsewhere:
   1. Shop Drawings, Work Drawings, and Samples: Section 01340
   2. Contract Closeout: Section 01700
   3. Project Record Documents: Section 01720
   4. Warranties and Bonds: Section 01740

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:
   1. Trained and experienced in maintenance and operation of described products.
   2. Familiar with requirements of this Section.
   3. Skilled as a technical writer to the extent required to communicate essential data.
   4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

B. Format:
1. Size: 8 1/2-inches x 11 inches.

2. Paper: 20 pound minimum, white, for typed pages.

3. Text: Manufacturer's printed data, or neatly typewritten.

4. Drawings:
   a. Provide reinforced punched binder tab, bind in with text.
   b. Reduce larger drawings and fold to size of text pages but not larger than 11 inches x 17 inches.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.
   a. Provide typed description of products and major component parts of equipment.
   b. Provide indexed tabs.

6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
   a. Title of Project.
   b. Identity of separate structure as applicable.
   c. Identity of general subject matter covered in the manual.

C. Binders:
   1. Commercial quality three O-ring binders with durable and cleanable plastic covers.
   3. When multiple binders are used, correlate the data into related consistent groupings.

1.04 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.
   1. Contractor, name of responsible principal, address and telephone number.
2. A list of each product required to be included, indexed to content of the volume.

3. List, with each product, name, address and telephone number of:
   a. Subcontractor or installer, manufacturer and supplier name, address and telephone number.
   
   b. A list of each product required to be included, indexed to content of the volume.

   c. Identify area of responsibility of each.

   d. Local source of supply for parts and replacement name, address and telephone number.

4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

   1. Include only those sheets which are pertinent to the specific product.

   2. Annotate each sheet to:

      a. Clearly identify specific product or part installed.

      b. Clearly identify data applicable to installation.

      c. Delete references to inapplicable information.

   3. Operation and maintenance information as herein specified.

   4. Record shop drawings as submitted and approved with all corrections made for each product.

C. Drawings:

   1. Supplement product data with drawings as necessary to clearly illustrate:

      a. Relations of component parts of equipment and systems.

      b. Control and flow diagrams.

   2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

   3. Do not use Project Record Documents as maintenance drawings.
D. Written text, as required to supplement product data for the particular installation:
   1. Organize in consistent format under separate headings for different procedures.
   2. Provide logical sequence of instructions of each procedure.

E. Copy of each warranty, bond and service contract issued.
   1. Provide information sheet for Owner's personnel, give:
      a. Proper procedures in event of failure.
      b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Submit six copies of complete manual in final form.

B. Content: for applied materials and finishes:
   1. Manufacturer's data, giving full information on products.
      a. Catalog number, size, and composition.
      b. Color and texture designations.
      c. Information required for reordering special manufactured products.
   2. Instructions for care and maintenance.
      a. Manufacturer's recommendation for types of cleaning agents and methods.
      b. Cautions against cleaning agents and methods which are detrimental to product.
      c. Recommend schedule for cleaning and maintenance.

C. Content, for moisture protection and weather-exposed products:
   1. Manufacturer's data, giving full information on products.
      a. Applicable standards.
      b. Chemical composition.
      c. Details of installation.
2. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: Respective sections of Specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit six copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.
   a. Function, normal operating characteristics, and limiting conditions.
   b. Performance curves, engineering data and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
   d. Summary of information listed on equipment and motor data plates.

2. Operating procedures:
   a. Start-up, break-in, routine and normal operating instructions.
   b. Regulation, control, stopping, shut-down and emergency instructions.
   c. Summer and winter operating instructions.
   d. Special operating instructions.

3. Maintenance procedures:
   a. Routine operations.
   b. Guide to "trouble-shooting".
   c. Disassembly, repair and reassembly.
   d. Alignment, adjusting and checking.

4. Servicing and lubrication required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
   a. Predicted life of parts subject to wear.
   b. Items recommended to be stocked as spare parts.
8. As-installed control diagrams by controls manufacturer.
10. Charts of valve tag numbers, with location and function of each valve.
11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
12. Other data as required under pertinent sections of specifications.
13. Approved record shop drawings with all corrections made, and a copy of the warranty statement, check-out memo, and demonstration test procedures and certification.

C. Content, for each electric and electronic system, as appropriate:
1. Description of system and component parts.
   a. Function, normal operating characteristics, and limiting conditions.
   b. Performance curves, engineering data and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
2. Circuit directories of panel boards.
   a. Electrical service
   b. Controls
3. As installed color coded wiring diagrams.
4. Operating procedures:
   a. Routine and normal operating instructions.
   b. Sequences required.
   c. Special operating instructions.
5. Maintenance procedures:
   a. Routine operations.
   c. Disassembly, repair and reassembly.
   d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.07 SUBMITTAL SCHEDULE

A. Submit two copies of preliminary draft of proposed formats and outlines of contents of Operation and Maintenance Manuals within 90 days after Notice to Proceed. Electronic version is acceptable.

B. Submit two copies of completed data in preliminary form no later than 20 days following Engineer's review of the last shop drawing of a product and/or other submittal specified under Section 01340, but no later than delivery of equipment. One copy will be returned with comments to be incorporated into the final copies and the other copy will be retained on-site for use in any early training.

C. Submit six (6) copies of approved manual in final form directly to the offices of the Engineer, SCS Engineers, within 10 days after the reviewed copy or last item of the reviewed copy is returned.

D. Provide six (6) copies of addenda to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to demonstration test, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

C. Instructors shall be fully qualified personnel as outlined within the individual equipment specifications. If no specific training specifications are listed with the equipment, the Contractor shall provide the instruction with qualified Contractor personnel.

D. The instructors shall provide for and prepare lesson scopes and handouts for up to five individuals designated by the Owner that outline the items to be covered. Separate sessions for operation and maintenance instruction shall be provided consecutively. Handouts shall be submitted to the Owner with at least one week's notice prior to the training sessions.

E. All instruction sessions shall be video taped with portable video cameras and tapes supplied by the Contractor. Video taping shall be made by the Contractor under the direction of the Owner with conventional VCR compatible taping equipment or supplied on DVD.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION
SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Scope of Requirements:
   1. Compile specified warranties and bonds as specified in these Specifications.
   2. Co-execute submittals when so specified.
   3. Review submittals to verify compliance with Contract Documents.
   4. Submit to Engineer for review and transmittal to Owner.

B. Related Work Described Elsewhere:
   1. Instructions to Bidders: Bid Bonds
   2. Conditions of the Contract: Performance Bond and Payment Bond
   3. Conditions of the Contract: Instructions to Contractors
   4. Contract Closeout: Section 01700

1.02 SUBMITTAL REQUIREMENTS

A. Assembly warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Two each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
   1. Product of work item.
   2. Firm, with name of principal, address and telephone number.
   4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service maintenance contract.

6. Provide information for Owner's personnel:
   a. Proper procedure in case of failure.
   b. Instances which might affect the validity or warranty or bond.

7. Contractor, name of responsible principal, address and telephone number.

**1.03 FORM OF SUBMITTALS**

A. Prepare in duplicate packets.

B. Format:

1. Size 8-1/2 inches x 11 inches, punch sheets for standard three-post binder.
   a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS".

   List:

   a. Title of Project.

   b. Name of Contractor.

C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two inches.

**1.04 WARRANTY SUBMITTALS REQUIREMENTS**

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. Manufacturer's warranty period shall be concurrent with Contractor's for one (1) year, unless otherwise specified, commencing at the time of final acceptance by Owner. Certain materials will require a longer term warranty. These limits will be designated in the specification for those materials.

B. Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment which has at least a 1 hp motor or which lists for more than $1,000. Engineer reserves the right to request warranties for equipment not classified as major. Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.
C. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of Owner acceptance, the Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the manufacturer shall not relieve Contractor of the one-year warranty starting at the time of Owner acceptance of the equipment.

D. Owner shall incur no labor or equipment cost during the guarantee period.

E. Guarantee shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by manufacturer.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 01900

SUGGESTED CONSTRUCTION SEQUENCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Contractor is required to furnish all labor, equipment, appliances and materials, and perform all operations required to initiate and complete this suggested construction sequence schedule.

B. All construction work for this project shall be sequenced in detail and the proposed schedule shall be accepted by the Owner prior to construction.

C. The work under this contract shall not interfere with on-going operations. Owner will work with Contractor to assure a continuous construction schedule on this contract. This being noted, the following is a general sequence of construction that is suggested to achieve the aforementioned with the understanding that the project will be conducted in three stages:

FOR THE CELL 7 CONSTRUCTION

1. Contractor to verify existing conditions and provide field survey of the Cell 7, 8A, 9, and 10A area

2. Contractor to verify control points and construction baseline locations.

3. Contractor to clear/grub site on south slope of north borrow pit

4. Contractor to set grade stakes for construction

5. Contractor to establish liner system base.

6. Contractor to install liner system

7. Contractor to provide survey(s) of liner.

8. Contractor to install soil protective/drainage layers.

9. Contractor to blade areas of Cells 8A, 9, and 10A to leave a smooth finish without potholes

10. Contractor to conduct field survey of the top of soil fill in the disposal areas constructed and in the Cell 8A (if not included in the construction project), 9, and 10A.
11. Contractor to install rain tarp
12. Contractor to install stormwater management system
13. Contractor to sod and/or seed and mulch disturbed areas as designated on the plans.
14. Contractor to provide survey of top of soil fill.

PART 2 - EXECUTION (NOT USED)

END OF SECTION
Section 01910
Contractor Compliance Requirements

Introduction

The safety and health of all contractors, customers, and employees of the New Hanover County Department of Environmental Management is of primary importance. As a result, the prevention of occupationally induced injuries and illnesses will be given precedence over operating productivity whenever necessary.

Our goal is to maintain a safety and health program conforming to all applicable OSHA standards and to lead in safety program management within our industry. To be successful will require contractor cooperation in all safety and health matters.

As a contractor you will be required, as part of your contract, to take an active role in the Department of Environmental Management safety and health program. The following contractor safety and health requirements, when adhered to, will ensure safety for contractors, customers, and County employees. Additionally, potential damage to equipment and property will be avoided. It is impossible to document all possible situations or to provide precise guidance for every contingency a contractor may encounter in the course of their work. However, adherence to the rules as written and the desire to apply safe work practices will result in the highest level of safety.

General Requirements

1. All contractor employees shall abide by the Department of Environmental Management safety and health rules and regulations at all times. The DEM Safety Manual is available for copy or review in each of the Department’s offices.

2. The contractor and all contracted employees are required to follow the procedures for signing in and out. Procedures may differ depending on the section of the department the contractor is working in; they will be explained fully before the work begins.

3. The contractor shall have a competent individual in charge at the job site to supervise the job, conduct an adequate accident prevention program, and ensure compliance to OSHA and DEM rules.

4. All accidents or injuries shall be reported immediately to the DEM Project Manager or Safety Manager.

5. Contractor employees are not allowed to enter areas other than the work site, unless it is required for the performance of their job.
6. The contractor shall inform the Project Manager of any known hazardous conditions that exist, due to the contract work being done, in areas where Departmental employees may be exposed to the known hazards.

7. The contractor shall provide Material Safety Data Sheets for all containers of hazardous substances brought onto DEM property.

8. The contractor shall sign the “Contractor Hold Harmless” waiver form in order to use any Department equipment.

9. Periodic job site inspections will be conducted by the DEM Project Manager or Safety Manager to ensure that the job is proceeding safely in accordance with safety rules.

10. Violation of these rules is grounds for immediate termination of contract work.

**Standards of Conduct**

The Department of Environmental Management has established standards to ensure the smooth, safe, and efficient operations of the Department. Violation of these standards is considered serious and may lead to termination of the contract. The following are prohibited:

1. Willful damage to any Departmental property, customer property, or the property of Department employees.

2. Possession, use, or distribution of alcohol, narcotics, or illegal drugs on Department property.

3. Possession of firearms, ammunition, concealed weapons, or explosives (unless properly authorized).

4. Abusive or threatening language, harassment, disrespectful behavior, workplace violence, or interfering with the work of Department employees.

5. Theft or attempted theft from the Department or Department employees.

6. Refusal to perform contracted work or refusal to obey instructions.

7. Sleeping on the job.

8. Negligence or conduct which could result in injury or damage to property.

Contractor Safety Training

Please place a check by each of the following categories in which one or more of your employees has been trained. It is understood that not all contractors will have employees who are trained in all of the areas listed.

- [ ] Personal Protective Equipment
- [ ] First Aid and CPR
- [ ] Lockout/Tagout
- [ ] Confined Space Entry
- [ ] Respiratory Protection
- [ ] Hazardous Communication
- [ ] Material Safety Data Sheets
- [ ] Fire Prevention and Protection
- [ ] Fall Protection
- [ ] Scaffolding
- [ ] Heavy Equipment Training/Certification (includes bulldozer, loader, forklift, excavator, grader, roller, back-hoe, bobcat)
- [ ] Welding, Cutting, and Brazing
- [ ] Electrical Safety
- [ ] Trenching/Excavation
- [ ] Other ________________________________
- [ ] Other ________________________________

* If the contracting company has ten (10) or more employees, they will be required to present OSHA 300 Logs, at a minimum for the past three calendar years, along with their bid.

The Department of Environmental Management reserves the right to ask for any training records from the categories that were checked above. The County reserves the right to reject the bid of any firm that cannot document proper safety training as it relates to conducting the work included in the contract.
Contractor Agreement to Comply

I, ______________________________, a representative of ___________________________ do hereby acknowledge that my company has received a copy of the guidelines governing contract work being performed on New Hanover County Department of Environmental Management property. It is agreed that as part of the contract my company and its employees will comply with these guidelines and all the written programs which apply to the work being performed.

Signed ___________________________  Date _____________________

(Contractor)

Please return this signed page to the designated Department of Environmental Management Project Manager. A copy of the signed form will be kept in the Safety Officer’s files.
DIVISION 2

SITE WORK
SECTION 02210
SITE EARTHWORK AND GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section consists of furnishing all necessary labor, equipment, material and transportation necessary to bring the pre-liner base grade, final landfill cell grade, berms, drainage ditches, erosion control devices and swales to the lines and grades as shown on the drawings and in the Specifications.

B. The CONTRACTOR must determine for himself the volume of material required for the performance of items included in the drawings and specifications.

C. CONTRACTOR shall be responsible for controlling stormwater runoff from the adjacent landfill slope through the use of berms, dikes, and swales to direct stormwater away from construction areas and to areas where CONTRACTOR shall remove stormwater from the excavation through the use of temporary pumps or other means and methods.

D. The CONTRACTOR shall control fugitive dust in accordance with local and state requirements.

E. Prior to site clearing operations, the CONTRACTOR shall implement appropriate temporary erosion and sedimentation controls.

F. Any damage to the existing landfill liner systems, roads, utilities, and any areas outside the project area, shall be repaired as directed by the ENGINEER at the CONTRACTOR’s expense.

1.02 DEFINITIONS

The following definitions apply only to the terms and conditions contained within this specification.

A. Suitable Soil: Suitable materials for fills other than synthetic liner system protective cover material shall be free from vegetation, organic material, marl, excessive silt, or muck. The OWNER may provide borrow sites within the project vicinity for fill material required, or the CONTRACTOR may provide the appropriate soil from an off-site borrow source(s) in accordance with the bid document.

Material suitable for use as synthetic liner system cover material shall be soil
available on the OWNER’s property or from off-site borrow as defined in the bid documents and shall be free of roots, stones, rocks and other debris. The CONTRACTOR shall have sufficient manpower to inspect continuously each load that is placed to verify this requirement.

B. Unsuitable Soil: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M-145.

C. Backfill: The suitable soil that is placed back into the Expansion and compacted after the unsuitable soils are excavated and removed. The backfill shall be free of clays and compacted to meet the specified requirements contained within these Specifications.

D. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

E. Optimum Moisture: Percentage of water in a specific material at maximum density.

F. Clearing: Removal of vegetative materials found on the surface of the ground such as trees, brush, etc.

G. Grubbing: Removal of materials at, or protruding from, the surface of the ground such as grass, stumps, roots, rocks, etc.

H. Stripping: Removal and disposal of all organic sod, topsoil, grass and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped.

I. Demolition: Deconstruction and removal of any existing stormwater system culverts, pipes, and/or access road.

1.03 RELATED WORK DESCRIBED ELSEWHERE

A. Section 02220 - Excavating, Backfilling, and Compaction

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing and Grubbing: Clearing and grubbing is required in areas within the construction zone of the drainage areas. In areas adjacent to the landfill property line the minimum removal of trees will be practiced. The Contractor will flag trees to be removed and will review the impacts with the CQA personnel on-site.
B. Stripping: Stripping of the grassy areas within the limits of construction for this project will be required.

3.02 PERFORMANCE

A. Excavation: Refer to Section 02220 - Excavating, Backfilling, and Compaction

B. Fills:

1. Fills shall be formed of suitable material placed in layers of not more than 8 inches in depth (around structures) and 12 inches in depth (backfill, embankments, and drainage conveyance) measured loose and rolled and/or vibrated with suitable equipment until compacted. Thickness of layers may be increased provided the equipment and methods used are proven by field density testing to be capable of compacting thicker layers to specified densities. Layer thickness shall be decreased if equipment and methods used are proven to be incapable of compacting layers to specified densities.

2. Rock that will not pass through a 3-inch diameter ring shall not be placed within the top 12 inches of the surface of the completed fill. Rock that will not pass through a 1-inch diameter ring shall not be placed within the top 4 inches of the completed fill. Broken concrete or asphaltic pavement shall not be used in fills.

3. Fill shall be compacted according to Section 02220 - Excavating, Backfilling And Compaction.

4. Final elevations shall be within 0.1 foot of the required elevation and surfaces shall be sloped to drain as shown on the Drawings. However, this variation does not exempt the contractor from meeting all minimum slopes and depths as indicated on the drawings. **If a dimension is noted as minimum then it must be constructed to at least that dimension.** The CONTRACTOR must review dimensions with ENGINEER prior to completion of each grading phase.

C. Laboratory and field density tests which, in the opinion of the ENGINEER, are necessary to establish compliance with the compaction requirements of these specifications, will be conducted at the OWNER's expense. Tests will be made at depths and locations selected by the ENGINEER or Testing Laboratory's Representative. **For the purpose of certification of construction the ENGINEER will utilize destructive depth checks that will be conducted by the soils engineer.**

D. Equipment placing fill material over the synthetic liner system shall do so according to Section 02220 - Excavating, Backfilling, and Compaction.
E. Fill placed on embankments must be placed with a small bulldozer/loader no larger than a Caterpillar D-4.
SECTION 02215

SAFETY PROCEDURE

PART 1 - GENERAL

1.01 SAFETY PROCEDURES IN AND AROUND THE LANDFILL

It is the CONTRACTOR’s responsibility to provide for all safety functions during the term of their work on the project site.

A. All work conducted in and around landfills shall be done in accordance with State and local requirements and OSHA Safety and Health Standards 29 CFR and shall conform to the Landfill Gas Division of the Solid Waste Association of North American (SWANA) A Compilation of Landfill Gas Field Practices and Procedures dated March, 1992.

Additionally, for construction in the vicinity of a known landfill area, the following steps should be taken to prevent injury:

1. A combustible gas indicator must be utilized at all times during trenching and drilling, or when construction occurs within 10 feet of an open excavation.

2. When trenching or drilling deeper than 2 feet into the fill, or in the presence of detectable concentrations of methane, the soils are to be wetted and the operating equipment shall be provided with spark-proof exhausts.

3. Foam fire extinguishers will be provided on all equipment working in the landfill.

4. Personnel within or near an open trench or drill hole will:
   a. be fully clothed
   b. wear shoes with non-metallic soles
   c. wear a hard hat and safety goggles or glasses

5. Exhaust blowers should be on hand to be used in cases where trenches may show a build-up of methane or lack of oxygen.

6. Smoking should not be permitted in any area within 500 feet of the excavation.
7. An attempt should be made to keep personnel away from a downwind proximity of any open trench, unless the trench is constantly monitored and declared safe.

8. The operator of trenching equipment should wear an organic vapor and acid gas respirator while operating the equipment in or astride any trench.

9. Before personnel are permitted to enter an open trench, the trench should be carefully monitored for methane and oxygen sufficiency. The personnel should also be provided with a continuous methane and oxygen monitor in their work area as long as they are in the excavation.

B. For construction near (within 1,000 feet) of a known landfill area, the following safety precautions should be taken:

1. The areas under construction must be checked with a combustible gas indicator before excavation to determine if methane gas is in the area.

2. Any excavations must be monitored for methane and oxygen deficiency if personnel are to be sent in. This must be carried out continuously, unless the presence of methane in the area can definitely be ruled out.

3. Should methane gas be found in the area, those precautions applicable to digging in the landfill shall also apply to this situation.

C. Safety procedures to adhere to when working in landfill generated gas atmospheres:

1. Personnel monitoring equipment: tri-techtors required for detecting:
   a. flammable gas
   b. low O₂
   c. toxic gas

2. At least one monitor for each work party.

3. All appliances used in landfill generated gas atmospheres, must be explosion proof, i.e., Class I, Division -I, Group C, or, as per the 1987 NEC.

4. Ventilation must be a minimum of 2,500 CFM and should be increased as excavation of area becomes larger.

5. Entrance into utility line access manhole covers should be done with extreme caution. Sparks can occur from metal manhole covers and rings.
6. Always sample the air in a manhole or confined space with a detector, before entering.

7. If flammable vapors or low oxygen atmosphere conditions prevail, ventilate before entering.

8. Never allow smoking, open lights in or near excavations or confined spaces.

D. CONTRACTOR NOTE: New Hanover County has a standing Health and Safety Plan that must be adhered to for construction activities at the facility. See Section 01910 for additional information.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 02220

EXCAVATING, BACKFILLING, AND COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work included under this Section consists of excavating, trenching, sheeting/shoring, grading, backfilling and compacting as required for the construction of the work as shown on the drawings and specified herein.

B. The CONTRACTOR must determine for himself the volume of material required for the performance of items included in the Contract plans and specifications.

C. Definitions:

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

2. Optimum Moisture: Percentage of water in a specific material at maximum density.

3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

4. Suitable: Suitable materials for fills other than synthetic liner system cover material shall be a noncohesive, nonplastic granular mixture of soil from the on-site borrow source or from an off-site borrow source(s), in accordance with the bid documents, and shall be free from vegetation, organic material, marl, silt or muck. Not more than 20 percent by weight of fill material shall pass the No. 200 sieve. The OWNER will provide borrow sites within County owned property for the additional fill material required for drainage soil over the liner system.

Material suitable for use as synthetic liner system cover material shall be soil from the on-site borrow source and shall be free of roots, stones, rocks and other debris. The CONTRACTOR shall have sufficient manpower to inspect continuously each load which is placed to verify this requirement. The material shall not contain any sharp or angular rock exceeding 1/4 inch in diameter, and be free from clay, loam or organic matter.
5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.

D. Plan For Earthwork: The CONTRACTOR shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. Prior to commencing the excavation, the CONTRACTOR shall submit a plan of his proposed operations to the ENGINEER for review. The CONTRACTOR shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. The prices established in the Bid for the work to be done will reflect all costs pertaining to the work. No claims for extras based on sub-strata or groundwater table conditions will be allowed.

1.02 APPLICABLE PUBLICATIONS

A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.03 QUALITY ASSURANCE/QUALITY CONTROL

A. Construction Quality Assurance (CQA) will include field and laboratory testing as required by the specifications which will be conducted by a qualified soil-testing laboratory representing and paid for by the OWNER. Re-testing of areas failing to meet the specification requirements will be conducted at the cost of the CONTRACTOR.

B. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR for testing of off-site soil borrow areas to demonstrate that the soil proposed to be imported to the site meets the minimum criteria. The CONTRACTOR shall give a minimum of 48 hours notice to the OWNER’S CQA testing laboratory prior to the testing services being needed for compaction and depth check testing. The CONTRACTOR shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Any and all tests which have to be repeated because of the failure of the tested material to meet specification shall be paid for by the CONTRACTOR and the cost of any tests shall be deducted from payments due the CONTRACTOR.

1. Qualifications for the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 15 calendar days prior to conducting any geotechnical laboratory or field testing related to the project.
1.04 SUBMITTALS

A. Submit to the ENGINEER for review the proposed methods of construction, including dewatering excavation, bedding compaction, and backfilling of the various portions of the work. Review shall be for method only. The CONTRACTOR shall remain responsible for the adequacy and safety of the methods.

B. For all borrow sources, the CONTRACTOR shall notify the ENGINEER in writing of the off-site material source for each soil type specified within Part 2 of this Section at least 15 calendar days prior to the date of anticipated use of such material. Notification shall include:

1. Supplier’s name

2. Borrow location

3. Documentation confirming adequate quantities are available for this project

4. A representative sample of the proposed material, consisting of one 5-gallon, sealed container from each borrow location

5. Test results for a minimum of 2 samples as required within Part 2.02 of this Section. The CONTRACTOR shall submit to the ENGINEER the parameters for the testing equipment. Parameters include, but not limited to, ASTM test method used, sieve sizes, liquids used for permeability testing, and parameters outlined in the appropriate ASTM test method.

1.05 JOB CONDITIONS

A. If, in the opinion of the ENGINEER, conditions encountered during construction warrant a change in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the contract price, as provided in the General Conditions.

1.06 PROTECTION

A. Sheeting and Bracing:

1. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, power poles, etc. from undermining, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the OWNER is of the opinion that at any point
sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the CONTRACTOR, and compliance with such order shall not relieve or release the CONTRACTOR from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the OWNER.

2. The CONTRACTOR shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheetinig shall be plumb and securely braced and tied in position. Sheetinig and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the CONTRACTOR at his own expense so as to provide the necessary clearances and dimensions.

3. Where sheeting and bracing is required to support the sides of excavations for structures, the CONTRACTOR shall engage a Professional Geotechnical ENGINEER, registered in the State of North Carolina, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and certification of this shall be provided by the Professional ENGINEER.

4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The CONTRACTOR shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.

5. The CONTRACTOR shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the OWNER may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The OWNER may direct that timber used for sheeting and bracing be cut off at any specified elevation.

6. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with common fill soil by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the OWNER.

7. The right of the OWNER to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders,
and his failure to exercise his right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

8. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage:

1. The CONTRACTOR shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The CONTRACTOR shall engage a Geotechnical ENGINEER registered in the State of North Carolina, to design the dewatering systems for all structures. The CONTRACTOR shall submit to the ENGINEER for review a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Professional ENGINEER. The Professional ENGINEER shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be needed to assure that the systems are performing satisfactorily.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation and to preserve the integrity of adjacent structures. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.

4. All liquids encountered that have been in contact with waste shall be treated as leachate and disposed of accordingly.

5. The CONTRACTOR shall take all additional precautions to prevent uplift of any structure during construction.
6. The conveying of water in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the CONTRACTOR. However, the CONTRACTOR shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the OWNER or the authority having jurisdiction, at no cost to the OWNER.

7. Flotation shall be prevented by the CONTRACTOR by maintaining a positive and continuous operation of the dewatering system. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure of this system.

8. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system shall be removed by the CONTRACTOR.

9. The CONTRACTOR shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All fill material shall be from the designated on-site borrow source or from an off-site borrow source that has been accepted by the ENGINEER, and shall be subject to review by the ENGINEER.

2. All fill material shall be well-drained, free of free of organic material, sticks, roots, trash, or other objectionable material and stones larger than 2-inch in any dimension. Excess or unsuitable material shall be removed from the job site by the CONTRACTOR.

B. Common Fill Material: Common fill shall be soil from the on-site or off-site borrow source and shall not contain stones, rock, concrete or other rubble larger than two (2) inches in diameter. No soil containing or contaminated by solid waste or other similar material will be allowed for use as common fill. Material shall be well-graded sand (SW), poorly graded sands (SP), silty-clayey sand (SP-SC), or clayey sand (SC) as classified by the Unified Soil Classification System, or other soil as approved by the ENGINEER. For soils with Atterberg limits, Liquid Limit shall be less than 30 with a Plasticity index greater than 10.
C. Structural Fill: Structural fill shall consist of material from the on-site or off-site borrow source and shall not contain loam or organic matter, or contain or be contaminated by solid waste or other similar material. Acceptable soil types as classified by the Unified Soil Classification System (ASTM D2487), SP, SP-SM, SC or SP-SC or other soil as approved by the ENGINEER. For soils with Atterberg limits, Liquid Limit shall be less than 30 with Plasticity index greater than 10.

D. Drainage/Protective Cover: The material used for the protective cover soil shall not contain any sharp or angular rock exceeding 3/8 inch in diameter, and not contain loam, or organic matter. The source of this material will be the borrow area designated by the County on the landfill or on the adjacent County owned property to the south. For material brought in from off-site, the material shall be a sand with a minimum hydraulic conductivity of 1x10^{-3} cm/sec, when a laboratory sample is compacted to 95 percent of the Standard Proctor, and conforming to the following gradation:

<table>
<thead>
<tr>
<th>U.S. Sieve Size</th>
<th>Percent Passing By Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>30</td>
<td>95</td>
</tr>
<tr>
<td>No. 50</td>
<td>65</td>
</tr>
<tr>
<td>No. 70</td>
<td>20</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-10</td>
</tr>
</tbody>
</table>

The above gradation may be modified by the ENGINEER if the soil gradation varies from the gradation curve above but still meets the permeability and geotextile requirements.

E. Additional Synthetic Liner System Subgrade Soil (If Necessary): If upon compaction, additional subgrade soil is necessary to meet the required design grades, as shown on the drawings, the soil shall consist of structural fill material from the on-site or off-site borrow source. The material used shall not contain any sharp or angular rock exceeding 3/8 inch in diameter, and not contain loam or organic matter.

F. Class I Soils\(^1\): Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

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\(^1\)Soils defined as Class I soils are not defined in ASTM D2487
1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

<table>
<thead>
<tr>
<th>U.S. Sieve Size</th>
<th>Percent Passing By Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>3/8</td>
<td>90-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>20-55</td>
</tr>
<tr>
<td>No. 8</td>
<td>5-30</td>
</tr>
<tr>
<td>No. 16</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 50</td>
<td>0-5</td>
</tr>
</tbody>
</table>

G. Class II Soils:

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

3. SW: Well-graded sands and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

4. SP: Poorly graded sands and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

H. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the CONTRACTOR and reviewed by the ENGINEER.

2.02 QUALIFICATIONS TESTS

A. Prior to placement, soils from off-site shall be tested in accordance with Table 02220-1.

B. Composite soil samples are not allowed.

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2In accordance with ASTM D2487, less than 4 percent pass No. 200 sieve.
C. Testing shall be repeated each time there is a visual change in the material or upon direction of the ENGINEER.

**TABLE 02220-1. SOIL QUALIFICATION TESTING**

<table>
<thead>
<tr>
<th>Material</th>
<th>Test</th>
<th>ASTM No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Fill</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard Proctor</td>
<td>D 698</td>
</tr>
<tr>
<td></td>
<td>Soil Classification</td>
<td>D 2487</td>
</tr>
<tr>
<td></td>
<td>Sieve Analysis</td>
<td>D 422</td>
</tr>
<tr>
<td></td>
<td>Atterberg Limits</td>
<td>D 4318</td>
</tr>
<tr>
<td><strong>Structural Fill</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil Classification</td>
<td>D 2487</td>
</tr>
<tr>
<td></td>
<td>Sieve Analysis</td>
<td>D 422</td>
</tr>
<tr>
<td></td>
<td>Atterberg Limits</td>
<td>D 4318</td>
</tr>
<tr>
<td></td>
<td>Standard Proctor</td>
<td>D 698</td>
</tr>
<tr>
<td><strong>Protective/Drainage Cover Soil</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sieve Analysis</td>
<td>D 422</td>
</tr>
<tr>
<td></td>
<td>Hydraulic Conductivity</td>
<td>D 5084</td>
</tr>
</tbody>
</table>

**PART 3 - EXECUTION**

**3.01 PREPARATION**

A. Clearing and Grubbing: Clearing and grubbing is required.

B. Stripping: At time of grading start-up, all areas within the limits of grading for Cell 7 or Cells 7 & 8A, shall be stripped of any existing grass and roots to a depth of six (6) inches.

Stripped material suitable for topsoil shall be stockpiled and shall be protected until it is replaced. Any topsoil remaining after all work is in place, shall be disposed of by the CONTRACTOR unless directed otherwise by the ENGINEER.

**3.02 EXCAVATION**

A. Excavation:

1. Excavation shall conform to the limits indicated on the drawings or specified herein. This work shall include shaping and sloping and other work necessary in bringing the earthwork to the required slope, alignment and cross section.

2. All suitable materials removed from the excavation shall be used as far as practicable in the formation of the embankments, subgrades, and other
places as directed. No excavated material shall be wasted without permission, and where necessary to waste such material it shall be at the direction of the ENGINEER. Unsuitable material shall be removed to the required depth and replaced to the satisfaction of the ENGINEER with suitable material.

3. All waste excavated material shall be considered property of the OWNER and disposed of as directed by the OWNER.

B. Excavating for Structures/Utilities:

General: Excavations for structures and utilities must be carefully executed in order to avoid interruption of the existing operations.

1. Excavation work shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.

   a. Excavation for precast or prefabricated structures shall be carried to an elevation 2 feet lower than the proposed outside bottom of the structure to provide space for the select backfill material.

   b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.

2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the work.

4. Encounters with subsurface obstructions shall be hand excavated.

5. Excavation and dewatering shall be accomplished by methods that preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the ENGINEER at the CONTRACTOR's expense.
6. The bottom of excavations shall be rendered firm and dry before placing any structure. Excavated material not suitable for backfill shall be removed from the site and disposed of by the CONTRACTOR.

7. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.

8. All locations and elevations as required herein must be permanently documented by the CONTRACTOR, on the Record Drawings prior to the ENGINEER's acceptance of the Application for Payment for that work.

3.03 DRAINAGE

A. The CONTRACTOR shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.

B. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with applicable rules and regulations.

C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24 hours after being placed. The CONTRACTOR shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.

D. The CONTRACTOR will be required at his expense to excavate below grade and refill with approved fill material if the OWNER determines that adequate drainage has not been provided.

3.04 UNDERCUT

A. If the bottom of any excavation is below that shown on the drawings or specified because of CONTRACTOR error, convenience, or unsuitable subgrade due to the CONTRACTOR's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be as directed by the OWNER.

3.05 FILL AND COMPACTION

A. Materials:

1. To the maximum extent available, excess earth obtained from excavations shall be used for the construction of fills and embankments.
2. Materials used as backfill (except areas in contact with synthetic liner system) shall be free from rocks or stones larger than two (2) inches in their greatest dimension; brush, stumps, logs, roots, debris, and organic or other deleterious materials; and must be acceptable to the ENGINEER.

3. Materials used as backfill in areas in contact with synthetic liner system shall be free of roots, stones, rocks and other debris; shall not contain any sharp or angular rock exceeding 1/4 inch in diameter, and be free from clay, loam or organic matter; and must be acceptable to the ENGINEER.

4. Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the ENGINEER. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials be in any backfill, fill or embankment.

B. Compact and backfill excavations and construct embankments according to the following schedule. (Standard Proctor shall be ASTM D 698):

<table>
<thead>
<tr>
<th>Area</th>
<th>Material</th>
<th>Compaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backfill, embankments, and</td>
<td>Common Fill (Para. 2.01 B)</td>
<td>12-inch lifts, rolled into place and compacted to 95% Standard Proctor density for berms stability.</td>
</tr>
<tr>
<td>drainage conveyance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beneath structures (minimum 2-foot</td>
<td>Structural Fill (Para. 2.01 C)</td>
<td>12-inch lifts, compacted to 95% Standard Proctor density. Fill should not be placed over any in-place soils until those layers have been compacted for stability.</td>
</tr>
<tr>
<td>depth)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Around structures (minimum 2-foot</td>
<td>Structural Fill (Para. 2.01 C)</td>
<td>8-inch lifts, compacted to 95% Standard Proctor density. Use light rubber-tired or vibratory plate compactors.</td>
</tr>
<tr>
<td>spacing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional synthetic liner system</td>
<td>(Para. 2.01 C)</td>
<td>synthetic liner system subgrade soil material shall be rolled and compacted to 95% Standard Proctor density.</td>
</tr>
<tr>
<td>subgrade soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective Soil over synthetic</td>
<td>Protective Cover Soil (Para. 2.01 D)</td>
<td>Material shall be rolled and compacted to 95% Standard Proctor density.</td>
</tr>
<tr>
<td>liner system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thickness of layers may be increased provided the equipment and methods used are proven by field density testing to be capable of compacting thicker layers to specified
densities. Layer thickness shall be decreased if equipment and methods used are proven to be incapable of compacting layers to specified densities.

C. Equipment placing fill material over the synthetic liner system must operate on an initial layer of fill of sufficient thickness to protect the underlying material from damage. The equipment shall be no larger than a Caterpillar D-4 or a Caterpillar D-6 with low ground pressure tracks, until sufficient cover material is in place to protect the underlying material from damage by equipment with higher ground pressures. The bulldozer movement shall be forward and backward, no turning will be allowed until a minimum of 2 feet of cover is placed above the synthetic liner system. All turning of equipment will be off the area underlain by synthetic liner system. A minimum thickness of 3 feet of granular material is specified between rubber-tired vehicles and the synthetic liner system. In areas of heavy traffic, such as access ramps, granular material thickness should be at least 3 feet. In any case, the following table shall be complied with:

<table>
<thead>
<tr>
<th>Equipment Ground Pressure (psi)</th>
<th>Minimum Lift Thickness (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;4.6</td>
<td>12</td>
</tr>
<tr>
<td>4.6 - 8</td>
<td>18</td>
</tr>
<tr>
<td>&gt;8 - 16</td>
<td>24</td>
</tr>
<tr>
<td>&gt;16</td>
<td>36</td>
</tr>
</tbody>
</table>

Fill placed on embankments must be placed with a small bulldozer/loader no larger than a Caterpillar D-4. The cover material must be pushed in place starting at the bottom and working upwards.

D. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

E. Excavations shall be backfilled to the original grade or to the slope and/or thickness indicated on the Drawings. Deviation because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

F. Embankments shall be constructed to the slopes and cross sections shown on the plans or ordered by the ENGINEER. Embankments shall be placed in successive layers for the full width of the embankment. As far as practicable, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.
G. If the CONTRACTOR requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the ENGINEER. Approval will be considered only after the CONTRACTOR has performed tests, at the CONTRACTOR's expense, to identify the material used and density achieved throughout the backfill area, utilizing the method of backfill requested. The ENGINEER's acceptance will be in writing.

3.06 TRENCH EXCAVATION

A. The CONTRACTOR shall not open more trench in advance of pipe laying than is necessary to expedite the work. Four hundred (400) feet shall be the maximum length of open trench on any line under construction. All trench excavation shall be open cut from the surface.

1. Alignment, Slope, and Minimum Cover: The alignment and slope of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith shall be in conformity with requirements of the section covering installation of pipe.

2. Where pipe slopes are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 42 inches where in paved or graded streets where surfaces grades are definitely established and 36 inches in other locations. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation.

B. Limiting Trench Widths:

1. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment.

C. Mechanical Excavation:

1. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, and other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

2. Mechanical equipment used for trench excavation shall be of the type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation one foot
above the top of the installed pipe to the bottom of the trench, and that
trench alignment is such that pipe when accurately laid to specified
alignment will be centered in the trench with adequate clearance between
the pipe and sidewalls of the trench. Undercutting the trench sidewall to
obtain clearance will not be permitted.

D. Artificial Foundations in Trenches: Whenever so ordered by the ENGINEER, the
CONTRACTOR shall excavate to such depth below grade as the ENGINEER
may direct and the trench bottom shall be brought to grade with such material as
the ENGINEER may order installed. All timber, concrete, or other foundations
made necessary by unstable soil shall be installed as directed by the ENGINEER.
Compensation for extra excavation and timber, concrete, or other foundations,
except where provided by contract unit prices, shall be made in accordance with
the contract provisions for extra work.

E. Bell Holes: Bell holes shall provide adequate clearance for tools and methods
used in installing pipe. No part of any bell or coupling shall be in contact with the
trench bottom, trench walls, or granular embedment when the pipe is jointed.

3.07 TESTS

A. The sampling and testing shall be performed by an independent soils testing
laboratory provided by the OWNER and accepted by the ENGINEER. The test
locations shall be selected by the ENGINEER or laboratory testing representative,
and shall include the following:

1. Standard Proctor density shall be established using laboratory remolded
soil samples taken from the borrow source intended for use for the
synthetic liner system subgrade and protective cover soil layers. The
Standard Proctor density developed in the laboratory shall be utilized for
these layers unless a change in borrow soil becomes apparent. If a change
in borrow soils is observed, a Standard Proctor density shall be developed
and utilized for the new material.

2. Synthetic Liner System Subgrade: Testing shall be conducted in a regular
grid pattern at a minimum frequency of one (1) test per 11,000 square feet
for the first three (3) acres and then one (1) test per 22,000 square feet
thereafter. Each site shall be tested for:
   a. In-place density, ASTM D2167-66 or D1556-64, as a percent of
      Standard Proctor Density.

3. Drainage/Protective Cover: At the time of delivery, drainage sand shall
undergo a sieve analysis to determine the percent passing the No. 200
sieve (< 10%) at an approximate frequency of one (1) per acre.
All other testing shall be conducted in a regular grid pattern at a minimum frequency of one (1) test per 11,000 square feet for the first three (3) acres and then one (1) test per 22,000 square feet thereafter. Each site shall be tested for:

a. In-place density, ASTM D 2167-66 or D 1556-64, as a percent of Standard Proctor density

b. Destructive Depth Check

c. Permeability, ASTM D 2434

B. Destructive Depth Check:

1. Total thickness measurements to determine the thickness of the in-place finished synthetic liner system protective cover soil material shall be conducted by the independent soils testing laboratory. **These destructive depth checks will be used by the ENGINEER for certification to DENR of the soils placement.** The thickness measurements shall be conducted using an ENGINEER accepted method. If the total thickness is less than designated on the Drawings, then the CONTRACTOR shall have two options, the cost of which shall be at no additional expense to the OWNER:

a. For failing thickness tests of the synthetic liner system protective cover soil layer, the CONTRACTOR can place additional soil material in the area between the closest four (4) test locations that passed.

b. The CONTRACTOR can further define the area of inadequate thickness by performing additional destructive depth checks at 50 feet intervals from the location of the failed test in all four (4) directions using an ENGINEER accepted method. If any of these samples fail, then the process shall be repeated to establish the zone in which the area should receive additional protective soil material. If these additional tests pass, then the test interval can be reduced to 20 feet intervals to determine a more accurate zone that will require additional soil material.

The repaired area will then be resampled at a frequency of one test per 11,000 square feet. If any samples show a depth less than designated on the Drawings, then the procedure as detailed above shall be repeated.

2. Holes produced as a result of the synthetic liner system protective cover soil layer destructive testing, shall be filled by the CONTRACTOR with the same soil materials. The replacement shall be placed in 4-inch lifts and shall be vigorously rod-tamped into place between lifts.
C. Permeability: Drainage sand material shall undergo one (1) permeability test per acre of installed material after laboratory compaction (remolded). Permeability results shall not be less than $1 \times 10^{-3}$ cm/sec.

D. Soil Test Results: Soil test results will be submitted to the CONTRACTOR within 48 hours of their receipt by the ENGINEER from the testing laboratory.

### 3.08 DRAINAGE MAINTENANCE

A. Trenches across roadways, driveways, walks, or other traffic ways adjacent to drainage ditches or water courses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the traffic way to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the CONTRACTOR. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed and the original sections, grades, and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

### 3.09 FINAL GRADING

A. After other outside work has been finished, and backfilling completed and settled, all areas on the site of the work which are to be graded shall be graded with the tolerance of 0.1 feet of the indicated cross section thicknesses and slopes. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. Unless otherwise shown, a slope of at least five percent (5%) shall be provided.

B. Grading and surfacing shall be completed to the satisfaction of the ENGINEER.

### 3.10 EXCESS EXCAVATED MATERIALS

A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings.

### 3.11 SETTLEMENT

A. The CONTRACTOR shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.

B. The CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the ENGINEER or OWNER.
END OF SECTION
SECTION 02221

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidental WORK necessary for the removal and disposal of structures, foundations, piping, roadway materials, or any part thereof including masonry, steel, reinforced concrete, plain concrete, asphalt, electrical facilities, and any other material or equipment shown or specified to be removed on the Contract Drawings.

B. The CONTRACTOR shall carry out demolition so that adjacent structures, which are to remain, are not endangered.

C. Work will include removal of roadway stone and stockpiling the material as directed by the county. All Demolition efforts will be coordinated with the County.

D. The COUNTY may wish to retain ownership of some of the materials and will direct the CONTRACTOR to a designated stockpile area if this is the case.

E. Provide dust control and make provisions for safety. CONTRACTOR shall comply with applicable Occupational Safety and Health Administration (OSHA) regulations, Federal, State and local safety requirements.

1.02 SUBMITTALS

A. Quality Control Submittals:
Permits: Submit one copy of each permit as required by Federal, State and local jurisdictions for all phases and operations of the WORK (if applicable).

1.03 QUALITY ASSURANCE

A. Permits: Before the WORK of this Section is started, the CONTRACTOR will be responsible for obtaining all permits required by Federal, State and local jurisdictions for all phases and operations of the WORK.

B. Demolition Plan: Before the WORK of this Section is started, CONTRACTOR will prepare a detailed Demolition Plan. The Demolition
Plan shall include, but not be limited to, detailed outline of intended demolition and disposal procedures. The Demolition Plan will not relieve the CONTRACTOR of complete responsibility for the successful performance of the WORK in accordance with all applicable Federal, State, and local codes and restrictions.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 PROTECTION

A. General Safety: The CONTRACTOR shall provide warning signs, protective barriers, and warning lights as necessary adjacent to the WORK as approved or required. The CONTRACTOR shall maintain these items during the demolition period as required.

B. Existing Services: Undertake no demolition WORK until all mechanical and electrical services affected by the WORK have been properly disconnected. Cap, reroute or reconnect interconnecting piping or electrical services that are to remain in service either permanently or temporarily. The CONTRACTOR shall locate, identify and protect utilities, benchmarks, piping, and structures that are not to be removed from damage during demolition activities.

C. Hazards: Perform testing and air purging where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, and eliminate the hazard before demolition is started.

3.02 DEMOLITION REQUIREMENTS

A. Explosives: The use of explosives will not be permitted.

B. Protection: Carefully protect all mechanical and electrical equipment against dust and debris.

C. Access: Provide safe access to, and egress from, all working areas at all times with adequate protection from falling material.

3.03 CONTROL

A. Survey tolerances shall be in accordance with Section 01050 - Field Engineering and Survey.
3.04 DISPOSAL OF MATERIALS

A. All debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition shall not be removed from the site or disposed of by the CONTRACTOR except as directed by the COUNTY or ENGINEER. The COUNTY will designate an on-site disposal area for demolition materials.

B. CONTRACTOR shall transport demolition materials, excess soils, etc. to an on-site disposal area as directed by the COUNTY as soon as practical. The CONTRACTOR will not be required to pay a disposal fee for the demolition materials. The cost for hauling demolition materials, excess soils, etc. shall be included in the Bid Price.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. The WORK specified in this Section shall include installing and maintaining erosion and sedimentation controls as necessary or as indicated on the Contract Drawings for proper execution of WORK. All erosion controls shall be installed and approved by the ENGINEER prior to beginning WORK. All existing and foreseeable conditions that affect the WORK both inside and outside the limits of construction shall be CONTRACTOR’S responsibility.

B. Temporary erosion controls include, but are not limited to:

1. Grassing, mulching, netting, seeding and watering on-site surfaces and soil and borrow area surfaces, providing interceptor ditches at those locations which will ensure erosion during construction will be either eliminated or maintained within acceptable limits as established by the regulatory agencies having jurisdiction.

C. Temporary sedimentation controls include, but are not limited to:

1. Silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the regulatory agencies having jurisdiction.

D. CONTRACTOR is responsible for providing effective temporary erosion and sediment control measures during execution of WORK or until final controls become effective or until the WORK is accepted by the ENGINEER. CONTRACTOR may, with ENGINEER’S approval, perform WORK outside the limits of construction to establish, maintain, or enhance erosion control systems.

E. The CONTRACTOR shall be responsible for loading and transporting debris materials (asphalt, rocks, sumps, municipal solid waste, etc.) not incorporated into the Project to the active filling area for disposal. The OWNER will not charge the CONTRACTOR a tipping fee, but the CONTRACTOR shall be responsible for all other costs such as loading, hauling the material, etc. Excavated waste materials shall be loaded into transport vehicles and hauled by the CONTRACTOR to the OWNER’s scale facility then to the landfill working face as directed by the COUNTY for disposal. At no time shall excavated debris
materials be stockpiled adjacent to the excavations after normal working hours.

F. At no time will stormwater runoff within the limits of construction be allowed to discharge to the stormwater system or offsite without proper water quality treatment. CONTRACTOR shall plan construction activities to assure that the discharge of leachate or contaminated stormwater outside the liner and leachate collection system does not occur.

G. CONTRACTOR shall be solely responsible for all costs (including investigation, sampling testing, analysis engineering and remedial construction) related to the discharge of leachate or contaminated stormwater outside the liner and leachate collection system resulting from ineffective control of leachate or stormwater discharge by CONTRACTOR.

H. CONTRACTOR shall install additional erosion and sedimentation control measures deemed necessary by the ENGINEER as a result of variations in the CONTRACTOR’s operations, or shall repair existing system as directed by the ENGINEER. Additional controls or repairs shall be installed at no additional cost to the OWNER.

I. All erosion and siltation control devices shall be checked regularly by the CONTRACTOR, especially after each rainfall event and will be cleaned out and/or repaired as required by the ENGINEER.

J. Submittal
   1. Submit to the ENGINEER for review prior to the start of construction, the erosion control procedures to be utilized for this project prior to construction. This shall be submitted in the form of a shop drawing titled “Erosion Control Plan”, and shall address all items in this section.

1.02 REFERENCE DOCUMENTS


PART 2 - PRODUCTS

2.01 EROSION CONTROL

A. Netting - fabricated of material acceptable to the OWNER and the ENGINEER.

2.02 SEDIMENTATION CONTROL

A. Bales - clean, seed-free cereal hay type.

B. Netting - fabricated material acceptable to the OWNER and the ENGINEER.
C. Filter stone - crushed stone conforming to North Carolina Department of Transportation (NCDOT) specifications.

D. Concrete block - hollow, non-load-bearing type.

E. Concrete exterior grade, Class B.

PART 3 - EXECUTION

3.01 EROSION CONTROL

A. Minimum procedures for grassing are:

1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, and roots larger than 1/2-inch in diameter and debris.

2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.

3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2 inches.

4. Apply netting over mulched areas on sloped surfaces.

5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02 SEDIMENTATION CONTROL

A. Install and maintain silt dams, traps, barriers, and appurtenances as necessary to prevent the movement of soils and any contaminated water from leaving the Project. Hay bales which deteriorate and filter stone which is dislodged shall be replaced at the CONTRACTOR’s expense.

3.03 PERFORMANCE

A. Should any of the temporary erosion and sediment control measures employed by the CONTRACTOR fail to produce results which comply with the requirements of the local regulatory authorities, the CONTRACTOR shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

B. During construction, any stripped or bare areas are to be covered immediately by mulch products or by sod or seed any mulch with temporary or permanent vegetation.

C. All swales, ditches, channels, retention ponds and detention areas are to be sodded or seeded as required as soon as possible.
END OF SECTION
SECTION 02371
RIPRAP

PART 1 GENERAL

1.01 SUMMARY
A. The work specified in this section consists of supplying and installing riprap material as shown on the plans and in the specifications.

1.02 UNIT PRICE - MEASUREMENT AND PAYMENT
A. Riprap:
   2. Basis of Payment: Includes supply and placing riprap.

1.03 QUALITY ASSURANCE
A. Furnish each aggregate material from single source throughout the Work.
B. Perform Work in accordance with North Carolina Department of Transportation Standard Specifications.

PART 2 PRODUCTS

2.01 MATERIALS
A. Furnish materials in accordance with Florida Department of Transportation Standard Specifications.
B. Riprap: Limestone or clean broken concrete; solid and nonfriable with rough and angular surfaces. Use broken stone or broken concrete meeting the following gradation and thickness requirements:

<table>
<thead>
<tr>
<th>Weight Maximum (pounds)</th>
<th>Weight 50% (pounds)</th>
<th>Weight Minimum (pounds)</th>
<th>Minimum Thickness (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>30</td>
<td>15^1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note 1 15 pound minimum is typical to size/weight relationship for a 6-inch stone.

C. Geotextile Fabric: Non-biodegradable, woven.
PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of existing conditions before starting work.

3.02 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap in channels, at pipe ends, and as indicated on Drawings.

C. Installed Thickness: As indicated on Drawings.
SECTION 02550

GEOTEXTILE

PART 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this section includes the manufacture, testing, and installation of non-woven geotextile for the Leachate Collection and Removal System and woven geotextile for the gravel access road as shown on the drawings and as specified herein.

1.02 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) shall be performed by the geotextile Installer. The Installer’s responsibilities shall include, but not be limited to:

1. Supervise all geotextile installation activities.

2. Perform and document quality control testing as specified herein.

3. Certify geotextile materials and installation as meeting requirements of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by a designated CQA Consultant retained by the OWNER.

C. The CQA CONSULTANT shall observe and inspect the geotextile installation activities.

D. The CQA CONSULTANT or his Inspector, shall obtain samples and perform conformance testing of the material as indicated below for the appropriate geotextile installed.

E. The CQA CONSULTANT shall submit a final report, signed and sealed by a licensed professional engineer, certifying the test results.

F. Based upon review of the CQC and CQA final reports, the CQA CONSULTANT will provide certification to the regulatory agencies that the geotextile was installed in accordance with the Contract Documents.

G. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers, or material above the geotextile and shall keep the CQA
CONSULTANT’s laboratory informed of the construction progress to provide sufficient time for laboratory testing.

1.03 SUBMITTALS

A. Submit manufacturer’s prequalification, test reports and data, specifications, installation instructions, roll dimensions, and geotextile approval form.

B. Submit copies of evaluation reports provided by the manufacturer demonstrating that properties for the materials comply with specification requirements.

C. ENGINEER’s approval shall be obtained prior to the use of any materials in the project.

PART 2 - PRODUCTS

2.01 WOVEN GEOTEXTILE

A. A woven geotextile fabric shall be furnished and installed on the compacted soil prior to placement of 6-inch gravel at the new gravel access road.

B. Material shall be an 8-oz woven geotextile as manufactured by Tencate Mirafi HP 570, or ENGINEER approved substitution conforming to the following minimum properties:

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>SPECIFICATION</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Opening Size</td>
<td>0.6 mm</td>
<td>ASTM D4751</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>30 gal/min/ft(^2)</td>
<td>ASTM D4491</td>
</tr>
<tr>
<td>Permeability</td>
<td>0.05 cm/sec</td>
<td>ASTM D4491</td>
</tr>
<tr>
<td>Permittivity</td>
<td>0.40 sec(^{-1})</td>
<td>ASTM D4491</td>
</tr>
<tr>
<td>Tensile Strength (at ultimate)</td>
<td>4800 lbs/ft(MD) 4800 lbs/ft(CD)</td>
<td>ASTM D4595</td>
</tr>
<tr>
<td>Tensile Strength (at 2% strain)</td>
<td>960 lbs/ft(MD) 1320 lbs/ft(CD)</td>
<td>ASTM D4595</td>
</tr>
<tr>
<td>Tensile Strength (at 5% strain)</td>
<td>2400 lbs/ft(MD) 2700 lbs/ft(CD)</td>
<td>ASTM D4595</td>
</tr>
<tr>
<td>Tensile Strength (at 10% strain)</td>
<td>4800 lbs/ft(MD) 4800 lbs/ft(CD)</td>
<td>ASTM D4595</td>
</tr>
</tbody>
</table>

(1) Tests Shall be performed once per every 40,000 square feet of geotextile

2.02 NON WOVEN GEOTEXTILE

A. A non woven geotextile fabric shall be furnished for the leachate collection and removal system and for the toe drains.

B. Material shall be 8-oz non woven geotextile as manufactured by Carthage Mills FX-80HSE or ENGINEER approved substitution conforming to the following minimum properties:
## CHARACTERISTICS SPECIFICATION TEST METHOD

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength</td>
<td>220 lbs</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Grab Tensile Elongation</td>
<td>50%</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Trapezoidal Tear</td>
<td>90 lbs</td>
<td>ASTM D 4533</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>575 lbs</td>
<td>ASTM D 6241</td>
</tr>
<tr>
<td>UV Resistance</td>
<td>70% @ 500 hrs</td>
<td>ASTM D 4355</td>
</tr>
<tr>
<td>Permittivity</td>
<td>1.26 sec⁻¹</td>
<td>ASTM D 4491</td>
</tr>
<tr>
<td>Water Flow Rate</td>
<td>90 g/min/ft²</td>
<td>ASTM D 4491</td>
</tr>
<tr>
<td>Permeability</td>
<td>0.25 cm/sec</td>
<td>ASTM D 4491</td>
</tr>
<tr>
<td>Apparent Opening Size (AOS)</td>
<td>80 US Std. Sieve</td>
<td>ASTM D 4751</td>
</tr>
<tr>
<td>Mass Per Unit Area (Minimum)</td>
<td>8.0 oz/yd²</td>
<td>ASTM D 5261</td>
</tr>
<tr>
<td>Thickness (Typical)</td>
<td>90 mils</td>
<td>ASTM D 5199</td>
</tr>
</tbody>
</table>

(1) Tests Shall be performed once per every 40,000 square feet of geotextile

### PART 3 - EXECUTION

#### 3.01 SHIPPING AND HANDLING

A. The MANUFACTURER typically assumes responsibility for initial loading and shipping of geotextiles. Unloading, on-site handling, and storage shall be the responsibility of the CONTRACTOR.

B. A visual inspection of each roll should be made as it is unloaded to identify if any packaging has been damaged. Rolls with damaged packaging should be repaired prior to being placed in storage.

C. The CONTRACTOR shall contact the MANUFACTURER prior to shipment to ascertain the appropriateness of the proposed unloading methods and equipment to be utilized.

D. The CONTRACTOR assumes all liability with regards to shipping, transport and unloading of the geotextiles required to complete the WORK. The OWNER shall not be responsible for damaged, lost or mis-stocked shipments, or mishandled or damaged materials.

#### 3.02 PROTECTION AND STORAGE

A. Each roll of material shall have a MANUFACTURER’S identification label. Each roll shall be labeled to provide product identification adequate for inventory and quality control purposes. The label shall provide as a minimum the MANUFACTURER’S name, product identification, lot number, roll number, and roll dimensions. Rolls shall be labeled as per ASTM D4873 Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples.

B. Materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture or other damaging conditions.
C. Rolls of geotextiles should not be stacked upon one another to the extent that deformation of the core occurs. Outdoor storage shall not exceed 6 months. All MANUFACTURER’S recommendations for stacking and storage shall be followed.

D. Storage of the geotextile rolls shall be the responsibility of the CONTRACTOR. A dedicated storage area shall be agreed upon between the OWNER and the CONTRACTOR. This area is to be selected such that it is away from high traffic areas and is level, dry and well-drained.

E. Rolls should be stored in a manner that prevents sliding or rolling from the stacks. This may be accomplished by the use of chock blocks or by use of the dunnage shipped between rolls. Rolls should be stacked at a height no greater than the lifting apparatus can be safely handled (typically no higher than four rolls).

F. All stored geotextiles must be covered with a plastic sheet or tarpaulin until their installation. Covering shall protect the geotextile from ultraviolet light exposure, precipitation, mud, dirt, puncture, cutting or any other damaging or deleterious conditions.

G. Geotextiles shall not be exposed to sunlight for more than 15 days unless otherwise specified and guaranteed by the geotextile MANUFACTURER.

3.03 INSTALLATION

A. Geotextiles shall be installed in accordance with the MANUFACTURER’S recommendations. No equipment shall be allowed to operate on the geotextile and any tears or damage to the geotextile shall be repaired prior to placement. The surface of the geotextile shall be kept relatively clean and free of debris during installation.

B. Geotextile shall not be placed in a trench that is excessively wet or has standing water.

C. Geotextile shall be placed in anchor trenches as shown in the Contract Drawings.

D. Geotextile sheets shall be joined in accordance with the MANUFACTURER’S recommendations.

E. The CONTRACTOR shall place all cover materials in such a manner to prevent damage to the materials, slippage of the underlying layers and excessive tensile stresses in the materials.

3.04 REPAIRS

A. Geotextile damaged during placement shall be replaced or repaired at the CONTRACTOR’S expense in accordance with MANUFACTURER’S recommendation. The CONTRACTOR shall be responsible for the
documentation of repairs describing location and type of repair. Repair documentation shall be submitted to the ENGINEER.

3.05  GEOTEXTILE EXPOSURE FOLLOWING PLACEMENT

A. Exposure of geotextiles to the elements between the time the geotextile is placed to the time backfilling operations are complete shall be limited to a maximum of 15 days to minimize ultraviolet damage. Any geotextile exposed to sunlight for more than 15 days shall be removed and replaced with new material at the CONTRACTOR’S expense.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Plans call for triplanar geocomposite in the leachate detection portion of the liner system. A double bonded triplanar geocomposite (geotextile bonded to both sides) shall be located on the cell sideslopes and on the cell floor.

B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the bid price. The OWNER is responsible for the Quality Assurance (QA) testing described in the approved CQA Plan.

1.02 MANUFACTURER’s QUALIFICATIONS

A. Single Source: All products or components of the product, used for construction shall be obtained from a single MANUFACTURER. Fusion of the geonet and geotextile, for each product, shall be completed by a single MANUFACTURER.

1.03 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) shall be performed by the tri-planar geocomposite Installer. The Installer’s responsibilities shall include, but not be limited to:

1. Supervise all triplanar geocomposite installation activities.

2. Perform and document quality control testing as specified herein.

3. Certify tri-planar geocomposite materials and installation as meeting requirements of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by a designated CQA Consultant retained by the OWNER.

C. The CQA CONSULTANT shall observe and inspect the tri-planar geocomposite installation activities.

D. The CQA CONSULTANT or his Inspector, shall obtain samples and perform conformance testing of the geocomposite as indicated in Section 3.02 C of this Section.
E. The CQA CONSULTANT shall submit a final report, signed and sealed by a professional engineer licensed in the State of North Carolina, certifying the test results.

F. Based upon review of the CQC and CQA final reports, the CQA CONSULTANT will provide certification to the regulatory agencies that the triplanar geocomposite was installed in accordance with the Contract Documents.

G. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the triplanar geocomposite and shall keep the CQA CONSULTANT’s laboratory informed of the construction progress to provide sufficient time for laboratory testing.

1.04 SUBMITTALS

A. Data showing MANUFACTURER has a minimum of 5,000,000 ft² of experience.

B. Product Information: The CONTRACTOR shall submit to the ENGINEER field and laboratory test data prior to importing and/or prior to any construction using the geocomposite. Submit the following information for each product 14 calendar days prior to installation, to the ENGINEER for approval:

1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02560-1, Table 02560-2, and Table 02560-3. In addition, the MANUFACTURER must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.

2. Transmissivity: Submit MANUFACTURERs test data that indicates transmissivity values shown in Table 02560-3 can be met at 100 hours of testing.

3. Roll Layout Drawings: Submit at a minimum, a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.

4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust,
puncture, or other damaging conditions.

5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.

6. Material Data: Submit complete MANUFACTURER's specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the MANUFACTURER's methodology to comply with the requirements specified for manufacturing quality control.

7. Manufacturing Quality Control (MQC): Submit a complete description of the MANUFACTURER's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.

8. Installation Instructions: Submit samples of the product with a complete set of specifications, and MANUFACTURER's complete written instructions for storage, handling, installation and joining.

9. Qualifications: Submit MANUFACTURER's qualifications for each product.

10. Geonet Resin: Submit the name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.

11. Transmissivity Test Results (ASTM D 4716), one representative test with the proposed geocomposite and the geomembrane material. Submit transmissivity test results that indicate the values shown in Table 02560-3 can be achieved using the specified project materials.

C. Manufacturing Quality Control (MQC): The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the CQA Consultant prior to material shipment:
1. Production Dates: Submit statement of production dates for each product.

2. Test Reports: See Part 3.01 of this Section for tests and test frequencies.

PART 2 - PRODUCTS

2.01 GEONET

A. The geonet shall be a tri-planar structure manufactured by extruding three sets of high density polyethylene strands to form a three dimensional structure to provide planar liquid flow. The geonet shall meet the property requirements listed in Table 02560-1

B. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be antioxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

2.02 GEOTEXTILE

A. The geotextile shall meet the requirements listed in Table 02560-2

2.03 TRIPLANAR GEOCOMPOSITE

A. The geocomposite shall be the 300-mil tri-planar geocomposite GSE TenDrain 300, as manufactured by GSE Environmental.

B. The final product material shall meet the requirements listed in Table 02560-3.

C. MANUFACTURER: The geocomposite shall be fabricated by heat bonding the geotextile to both sides of the geonet. No burn-through of geotextiles shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02560-3. Visible lack of bonding of any areas exceeding one square foot or multiple locations on the same roll that are considered excessive by the ENGINEER will be cause for rejection of the roll of material.

D. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:

1. MANUFACTURER's name.
2. Product identification.
3. Lot number.
4. Roll number.
5. Roll dimensions.

E. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.

F. Transmissivity Test Results (ASTM D 4716), one representative test with the proposed geocomposite and the geomembrane material. Submit transmissivity test results that indicate the values shown in Table 02560-3 can be achieved using the specified project materials.

PART 3 - EXECUTION

3.01 MANUFACTURING QUALITY CONTROL TESTING

A. All of the specified tests are the CONTRACTOR's responsibility. Testing during manufacturing shall be accomplished by the MANUFACTURER's laboratory.

B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02560-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer Density</td>
<td>ASTM D 792</td>
<td>1 per batch</td>
</tr>
<tr>
<td>Polymer Melt Index</td>
<td>ASTM D 1238</td>
<td>1 per batch</td>
</tr>
</tbody>
</table>

C. The geonet shall be tested during manufacturing for compliance with Table 02560-1. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer Density</td>
<td>ASTM 1505</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D 5199</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D 4595</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Carbon Black</td>
<td>ASTM D 4218</td>
<td>1/100,000 sf</td>
</tr>
</tbody>
</table>

D. Geotextile shall be tested during manufacturing for compliance with Table 02560-2. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permittivity</td>
<td>ASTM D4491</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Mass per Unit Area</td>
<td>ASTM D 3776</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>AOS</td>
<td>ASTM D 4751</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>ASTM D 4632</td>
<td>1/100,000 sf</td>
</tr>
</tbody>
</table>
Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02560-3. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>ASTM D 4533</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>ASTM D 6241</td>
<td>1/100,000 sf</td>
</tr>
</tbody>
</table>

E. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected (See 2.03 C above).

F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected (See 2.03 C above).

3.02 CQA CONFORMANCE TESTING

A. In-Plant Conformance Sample Testing Services – The OWNER’s REPRESENTATIVE or CQA CONSULTANT have qualified personnel to collect conformance samples directly at the facility.

1. Conformance sample(s) of the geocomposite will be collected by the OWNER’s REPRESENTATIVE or CQA CONSULTANT prior to shipment to the site.

2. Conformance sample(s) of the geocomposite will be tested by the CQA CONSULTANT prior to shipment to the site.

3. The Contractor shall coordinate with the MANUFACTURER, CQA CONSULTANT, and OWNER to schedule the date of delivery of the geocomposite to the site.

4. The Contractor shall inform, in writing, the CQA Consultant and Engineer 14 day prior to the actual date of shipment from the MANUFACTURER. Geocomposite shall not be shipped prior to testing without OWNER’s approval.

5. Geocomposite products shipped to the site without prior sampling and approved conformance test results shall be sampled and tested upon delivery to the project site by the CQA Consultant. All costs associated with collecting and shipping samples from the project site will be the Contractor’s responsibility. The Contractor shall allow a minimum of 7 days for sampling and testing approval of geocomposite materials upon delivery to the project site prior to installation.
6. Once sampled at the MANUFACTURER’s plant geocomposite products shall not be added or removed from the shipment. Upon addition or removal of products the following conditions shall prevail:

a. Geocomposite products added shall be sampled for conformance testing at the Contractor’s expense.

b. Individual geocomposite products removed from the shipment, which have been previously sampled or tested – Additional samples that have identical lot or batch numbers shall be sampled for conformance testing at the Contractor’s expense.

B. Conformance Sample Test Frequency. The geocomposite shall be randomly sampled by the OWNER’s REPRESENTATIVE or CQA CONSULTANT at a rate of one sample per lot, or one sample per 100,000 square feet of material unless otherwise specified, from consecutively numbered rolls, whichever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the OWNER’s expense.

C. The initial conformance tests shall include the following:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEONET</td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D 5199</td>
</tr>
<tr>
<td>Tensile Strength - MD</td>
<td>ASTM D 4595</td>
</tr>
<tr>
<td>Carbon Black</td>
<td>ASTM D 4218</td>
</tr>
<tr>
<td>Polymer Density</td>
<td>ASTM D 1505</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>GEOTEXTILE</td>
<td></td>
</tr>
<tr>
<td>Mass per Unit Area</td>
<td>ASTM D 5261</td>
</tr>
<tr>
<td>AOS</td>
<td>ASTM D 4751</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>ASTM D 6241</td>
</tr>
<tr>
<td>Permittivity</td>
<td>ASTM D 4491</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>ASTM D 4533</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>GEOCOMPOSITE</td>
<td></td>
</tr>
<tr>
<td>Ply Adhesion - MD</td>
<td>GRI GC7</td>
</tr>
<tr>
<td>Transmissivity</td>
<td>ASTM D 4716</td>
</tr>
<tr>
<td>Interface Friction Angle</td>
<td>ASTM D 5321</td>
</tr>
</tbody>
</table>

Note: Required test results shall be in conformance with Table 02560-1, Table 02560-2, and Table 02560-3.

D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The averaged test results of the
geocomposite samples shall meet or exceed the Contract Documents and Specifications.

E. Samples that do not satisfy the Contract Documents and Specifications shall be cause to reject applicable rolls. All material from a lot represented by a failing test should be rejected or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications. If a geocomposite sample fails to meet Contract Documents and Specifications, subsequent tests shall be performed at the ENGINEERS discretion on additional geocomposite samples produced from the same resin batch to determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. Rejected rolls will not be installed and shall be removed from the project at no additional cost to the OWNER. (This procedure is only valid when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

F. The CQA Consultant shall review all conformance test results and accept or reject the roll prior to deployment. All nonconforming test results shall be reported to the OWNER and Installer. The CQA Consultant is responsible for reviewing test results to verify that the property values meet or exceed values listed in the project Specifications.

G. If any failing test results may be the result of the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

3.03 FIELD QUALITY CONTROL

A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02560-4.

B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:

1. Reference to product submittals, certifications, substitutions and approvals.

2. Dates of installation.

3. Location and quantity of materials installed.
4. Statement of whether materials were installed in accordance with the Technical Specifications.

5. Additional information as required.

6. All product certifications, filed appropriately for future reference.

3.04 MANUFACTURER'S RECOMMENDATIONS

A. Each Product shall be installed in accordance with the plans, specifications, and the MANUFACTURER's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

3.05 CLEANLINESS

A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water is present, the CONTRACTOR shall clean the work area. Products which are clogged with silts or other materials shall be discarded and shall not be installed.

3.06 ROLL JOINING METHODS

A. Table 02560-4 summarizes acceptable roll joining methods.

B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.

C. Nylon Ties: The geonet shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.

D. Machine Sewn Seams: The top layer of geotextile shall be sewn. Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with MANUFACTURER's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

3.07 ROLL JOINING REQUIREMENTS

A. The minimum requirements for joining rolls are specified in Table 02560-4.

B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.
C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

3.08 INSTALLATION

A. The product shall be installed in accordance with the MANUFACTURER's recommendations or as specified herein, whichever is more stringent.

B. Orientation:

1. Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).

C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.

D. Physical Damage:

1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.

2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.

E. Bridging: The product shall be installed to avoid bridging.

F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.

G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be covered within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.

H. The geocomposite shall be properly anchored within the anchor trench to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.
I. If there are any obstructions (such as outlet pipes or monitoring wells) while deploying the geocomposite, the geocomposite shall be cut to fit around the obstruction. Care should be taken as to make sure there is no gap between the obstruction and the geocomposite. The geocomposite should be cut in a way that the lower geotextile and geonet core is in contact with the obstruction and the upper geotextile has an excess overhang. There must be enough of the upper geotextile to be able to tuck the upper geotextile back under the geocomposite to protect the exposed core. This will prevent any soil particles from migrating into the geonet core flow channels.

J. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the ENGINEER.

3.09 REPAIRS

A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.

B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosynthetics.

C. Major Damage - Major damage is defined as a hole larger than 2 inches in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

<table>
<thead>
<tr>
<th>Property</th>
<th>Qualifier</th>
<th>Unit</th>
<th>Test Method</th>
<th>Specified Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>Minimum</td>
<td>mils</td>
<td>ASTM D 5199</td>
<td>300</td>
</tr>
<tr>
<td>Tensile Strength (machine direction)</td>
<td>+/- 10%</td>
<td>lbs/ft</td>
<td>ASTM D 7179</td>
<td>100</td>
</tr>
<tr>
<td>Carbon Black</td>
<td>Range</td>
<td>percent</td>
<td>ASTM D 4218</td>
<td>2-3</td>
</tr>
<tr>
<td>Polymer Density</td>
<td>Minimum</td>
<td>g/cm³</td>
<td>ASTM D 792</td>
<td>0.94</td>
</tr>
<tr>
<td>Polymer Melt Index</td>
<td>Maximum</td>
<td>g/10min</td>
<td>ASTM D 1238</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Table 02560-3. Geocomposite Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Qualified</th>
<th>Unit</th>
<th>Test Method</th>
<th>Specified Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity (Note 1)</td>
<td>Minimum</td>
<td>m²/sec</td>
<td>ASTM D 4716</td>
<td>Geomembrane/Geocomposite/ Geomembrane = 2.7 x 10⁻³</td>
</tr>
<tr>
<td>Ply Adhesion</td>
<td>Average</td>
<td>lbs/inch</td>
<td>GRI GC7</td>
<td>1.0</td>
</tr>
<tr>
<td>Coefficient of Interface Friction w/ Geomembrane (Note 2)</td>
<td>Minimum</td>
<td>degrees</td>
<td>ASTM D 5321</td>
<td>Peak 20.5°</td>
</tr>
</tbody>
</table>

Notes:

1. Per ASTM D 4716, one sample per 200,000 square feet, with a normal stress of 16,000 psf; water at 20°C (68°F); gradient of 0.02; profile of upper load plate, composite, geomembrane, composite, and lower load plate; and a test time period of 100 hours. Apply normal stress, under saturated conditions, for 1 hour minimum prior to start of test. Test data from the MANUFACTURER using the identical testing configuration and parameter shall indicate that transmissivity values when tested in excess of 100 hours do not fall below the minimum value of Table 02560-3. Thickness of the core geonet must be monitored during application of the normal compressive load and flow testing. Report to provide hydraulic conductivity.

2. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. The testing criteria are as follows: The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 24 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, 8,000, and 16,000 psf. The strain rate is 1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 20.5 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of
peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

**TABLE 02560-4. GEOCOMPOSITE JOINING METHODS**

<table>
<thead>
<tr>
<th>Location</th>
<th>Layer</th>
<th>Joining Method</th>
<th>Min. Overlap</th>
<th>Tying Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll End (See Note 1)</td>
<td>Upper geotextile</td>
<td>Machine sewing</td>
<td>4”</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Geonet</td>
<td>Nylon ties</td>
<td>6”</td>
<td>2' on center</td>
</tr>
<tr>
<td></td>
<td>Lower geotextile</td>
<td>Overlap</td>
<td>6”</td>
<td>N/A</td>
</tr>
<tr>
<td>Roll Side</td>
<td>Upper geotextile</td>
<td>Machine sewing</td>
<td>4”</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Geonet</td>
<td>Nylon ties</td>
<td>4”</td>
<td>5' on center</td>
</tr>
<tr>
<td></td>
<td>Lower geotextile</td>
<td>Overlap</td>
<td>6”</td>
<td>N/A</td>
</tr>
<tr>
<td>Repair of minor damage (See Note 2)</td>
<td>Upper geotextile</td>
<td>Machine sewing/thermal bonding</td>
<td>12”</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Geonet</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes:
1. At termination of geocomposite fold over upper geotextile as defined in Part 3.07B.
2. Minor damage is defined in Part 3.09B.

**END OF SECTION**
SECTION 02561

TRI-AXIAL GEOCOMPOSITE

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Contract Drawings call for a tri-axial geocomposite, which is a three-layer material, comprised of an inner core of high density polyethylene (HDPE) geonet between an upper and lower layer of non-woven geotextile. The geotextile is thermally fused to both sides of the geonet.

B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the Bid Price. The OWNER is responsible for the Quality Assurance (QA) testing described in the approved CQA Plan.

1.02 MANUFACTURER'S QUALIFICATIONS

A. Single Source: All products or components of the product, used for construction shall be obtained from a single manufacturer. Fusion of the geonet and geotextile, for each product, shall be completed by a single manufacturer.

1.03 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) shall be performed by the tri-axial geocomposite INSTALLER. The INSTALLER’s responsibilities shall include, but not be limited to:

1. Supervise all tri-axial geocomposite installation activities.

2. Perform and document quality control testing as specified herein.

3. Certify tri-axial geocomposite materials and installation as meeting requirements of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by a designated CQA CONSULTANT and QA TESTING LABORATORY retained by the OWNER.

C. The CQA CONSULTANT or OWNER’S REPRESENTATIVE shall obtain samples and perform conformance testing of the geocomposite as indicated in section 3.02.C of this Section.
D. The CQA CONSULTANT, or his CQA REPRESENTATIVE, shall observe and inspect the tri-axial geocomposite installation activities.

E. The CQA CONSULTANT shall obtain samples and perform conformance testing of the geocomposite as indicated in Section 3.02 C of this Section.

F. The CQA Consultant shall submit a final report, signed and sealed by a professional engineer licensed in the State of North Carolina, certifying the test results.

G. Based upon review of the CQC and CQA final reports, the CQA CONSULTANT will provide certification to the regulatory agencies that the tri-axial geocomposite was installed in accordance with the Contract Documents.

H. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the geocomposite and shall keep the CQA CONSULTANT’s QA TESTING LABORATORY informed of the construction progress to provide sufficient time for laboratory testing.

1.04 SUBMITTALS

A. Data showing manufacturer has a minimum of 5,000,000 ft² of experience.

B. Product Information: Submit the following information for each product 14 calendar days prior to installation, to the ENGINEER for approval:

1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02561-1, Table 02561-2, and Table 02561-3. In addition, the MANUFACTURER must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.

2. Transmissivity: Submit MANUFACTURER’S test data that indicates transmissivity values shown in Table 02561-3 can be met at 100 hours of testing.

3. Roll Layout Drawings: Submit at a minimum, a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.

4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the
methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.

5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.

6. Material Data: Submit complete MANUFACTURER’S Specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the MANUFACTURER’S methodology to comply with the requirements specified for manufacturing quality control.

7. Manufacturing Quality Control (MQC): Submit a complete description of the manufacturer's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.

8. Installation Instructions: Submit samples of the product with a complete set of specifications, and MANUFACTURER’S complete written instructions for storage, handling, installation and joining.

9. Qualifications: Submit MANUFACTURER’S qualifications for each product.

10. Geonet Resin: Submit the name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.

C. Manufacturing Quality Control (MQC): The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the CQA CONSULTANT prior to material shipment:

1. Production Dates: Submit statement of production dates for each product.
2. Test Reports: See Part 3 of this Section for tests and test frequencies.
PART 2 -PRODUCTS

2.01 GEONET

A. The CDN shall consist of a triaxial void maintaining geonet with a non-woven geotextile heat bonded to both sides to provide water flow meeting the requirements listed in Table 02931-1.

B. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be antioxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

2.02 GEOTEXTILE

A. The geotextile shall meet the requirements listed in Table 02561-2.

2.03 TRI-AXIAL GEOCOMPOSITE

A. The tri-axial geocomposite shall be the 330 mil GSE DuraFlow as manufactured by GSE Lining Technology, Inc., or an ENGINEER approved equal.

B. The final product material shall meet the requirements listed in Table 02561-3.

C. Manufacturer: The geocomposite shall be fabricated by heat bonding the geotextile to one or both sides of the geonet. No burn-through of geotextiles shall be permitted. No glue or adhesive shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02561-3.

D. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:

   1. MANUFACTURER'S name.
   2. Product identification.
   3. Lot number.
   4. Roll number.
   5. Roll dimensions.

E. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.
PART 3 - EXECUTION

3.01 MANUFACTURING QUALITY CONTROL TESTING

A. All of the specified tests are the CONTRACTOR'S responsibility. Testing during manufacturing shall be accomplished by the MANUFACTURER'S laboratory.

B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02561-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer Density</td>
<td>ASTM D 1505</td>
<td>1 per batch</td>
</tr>
<tr>
<td>Polymer Melt Index</td>
<td>ASTM D 1238</td>
<td>1 per batch</td>
</tr>
</tbody>
</table>

C. The geonet shall be tested during manufacturing for compliance with Table 02561-1. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer Density</td>
<td>ASTM D 1505</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D 5199</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D 7179</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Carbon Black</td>
<td>ASTM D 4218</td>
<td>1/100,000 sf</td>
</tr>
</tbody>
</table>

D. Geotextile shall be tested during manufacturing for compliance with Table 02561-2. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permittivity</td>
<td>ASTM D 4491</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Mass per Unit Area</td>
<td>ASTM D 5261</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>AOS</td>
<td>ASTM D 4751</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>ASTM D 4632</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>ASTM D 4533</td>
<td>1/100,000 sf</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>ASTM D 6241</td>
<td>1/100,000 sf</td>
</tr>
</tbody>
</table>

E. Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02561-3. The following minimum test frequencies shall be observed:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Minimum Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity</td>
<td>ASTM D 4716</td>
<td>1/200,000 sf</td>
</tr>
<tr>
<td>Ply Adhesion (minimum)</td>
<td>GRI GC7</td>
<td>1/100,000 sf</td>
</tr>
</tbody>
</table>
F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected. Visible lack of bonding of any areas exceeding one square foot or multiple locations on the same roll that are considered excessive by the ENGINEER will be cause for rejection of the roll of material.

3.02  CQA CONFORMANCE TESTING

A. In-Plant Conformance Sample Testing Services – The OWNER’s REPRESENTATIVE or CQA CONSULTANT have qualified personnel to collect conformance samples directly at the following facilities:

- GSE Lining Company
- AGRU America
- Poly-Flex, Inc.

1. Conformance sample(s) of the geocomposite will be collected by the OWNER’s REPRESENTATIVE or CQA CONSULTANT prior to shipment to the site.

2. Conformance sample(s) of the geocomposite will be tested by the CQA CONSULTANT prior to shipment to the site.

3. The Contractor shall coordinate with the MANUFACTURER, CQA CONSULTANT, and OWNER to schedule the date of delivery of the geocomposite to the site.

4. The Contractor shall inform, in writing, the CQA Consultant and Engineer 14 days prior to the actual date of shipment from the MANUFACTURER. Geocomposite shall not be shipped prior to testing without OWNER’s approval.

5. Geocomposite products shipped to the site without prior sampling and approved conformance test results shall be sampled and tested upon delivery to the project site by the CQA CONSULTANT. All costs associated with collecting and shipping samples from the project site will be the CONTRACTOR’s responsibility. The CONTRACTOR shall allow a minimum of 7 days for sampling and testing approval of geocomposite materials upon delivery to the project site prior to installation.

6. Once sampled at the MANUFACTURER’s plant geocomposite products shall not be added or removed from the shipment. Upon addition or removal of products the following conditions shall prevail:

   a. Geocomposite products added shall be sampled for conformance testing at the CONTRACTOR’s expense.
b. Individual geocomposite products removed from the shipment, which have been previously sampled or tested – Additional samples that have identical lot or batch numbers shall be sampled for conformance testing at the CONTRACTOR’s expense.

B. Conformance Sample Test Frequency. The geocomposite shall be randomly sampled by the OWNER’s REPRESENTATIVE or CQA CONSULTANT at a rate of one sample per lot, or one sample per 100,000 square feet of material unless otherwise specified, from consecutively numbered rolls, whichever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the OWNER’s expense.

C. The initial conformance tests shall include the following:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEONET</td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D 5199</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D 4595</td>
</tr>
<tr>
<td>Carbon Black</td>
<td>ASTM D 4218</td>
</tr>
<tr>
<td>Polymer Density</td>
<td>ASTM D 1505</td>
</tr>
<tr>
<td>GEOTEXTILE</td>
<td></td>
</tr>
<tr>
<td>Mass per Unit Area</td>
<td>ASTM D 5261</td>
</tr>
<tr>
<td>AOS</td>
<td>ASTM D 4751</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>ASTM D 6241</td>
</tr>
<tr>
<td>Permittivity</td>
<td>ASTM D 4491</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>ASTM D 4533</td>
</tr>
<tr>
<td>GEOCOMPOSITE</td>
<td></td>
</tr>
<tr>
<td>Ply Adhesion</td>
<td>GRI GC7</td>
</tr>
<tr>
<td>Transmissivity</td>
<td>ASTM D 4716</td>
</tr>
<tr>
<td>Interface Friction Angle for geocomposite/geomembrane</td>
<td>ASTM D 5321</td>
</tr>
</tbody>
</table>

Note: Required test results shall be in conformance with Table 02561-1, Table 02561-2, and Table 02561-3.

D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The test results of the geocomposite samples shall meet or exceed the Contract Documents and Specifications.

E. Samples that do not satisfy the Contract Documents and Specifications shall be cause to reject applicable rolls. If a geocomposite sample fails to meet Contract Documents and Specifications, subsequent tests shall be performed at random on additional geocomposite samples produced from the same resin batch to
determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. Rejected rolls will not be installed and shall be removed from the project at no additional cost to the OWNER.

3.03 FIELD QUALITY CONTROL

A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02561-4.

B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:

1. Reference to product submittals, certifications, substitutions and approvals.
2. Dates of installation.
3. Location and quantity of materials installed.
4. Statement of whether materials were installed in accordance with the Technical Specifications.
5. Additional information as required.
6. All product certifications, filed appropriately for future reference.

3.04 MANUFACTURER’S RECOMMENDATIONS

A. Each Product shall be installed in accordance with the plans, specifications, and the MANUFACTURER's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

3.05 CLEANLINESS

A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water is present, the CONTRACTOR shall clean the work area. Products which are clogged with silts or other materials shall be discarded and shall not be installed.

3.06 ROLL JOINING METHODS

A. Table 02561-4 summarizes acceptable roll joining methods.
B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.

C. Nylon Ties: The geonet shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.

D. Machine Sewn Seams: The top layer of geotextile shall be sewn. Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with manufacturer's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

3.07 ROLL JOINING REQUIREMENTS

A. The minimum requirements for joining rolls are specified in Table 02561-4.

B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

3.08 INSTALLATION

A. The product shall be installed in accordance with the manufacturer's recommendations or as specified herein, whichever is more stringent.

B. Orientation:

1. Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).

C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.
D. Physical Damage:

1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.

2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.

E. Bridging: The product shall be installed to avoid bridging.

F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.

G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be covered within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.

H. The geocomposite shall be properly anchored within the anchor trench to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.

I. If there are any obstructions (such as outlet pipes or monitoring wells) while deploying the geocomposite, the geocomposite shall be cut to fit around the obstruction. Care should be taken as to make sure there is no gap between the obstruction and the geocomposite. The geocomposite should be cut in a way that the lower geotextile has an excess overhang. There must be enough of the upper geotextile to be able to tuck the upper geotextile back under the geocomposite to protect the exposed geonet core. This will prevent any soil particles from migrating into the geonet core flow channels.

J. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the ENGINEER.

3.09 REPAIRS

A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.
B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosynthetics.

C. Major Damage - Major damage is defined as a hole larger than 2 inches in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

3.10 PLACEMENT OF PROTECTIVE COVER

A. Placement of Protective Cover Soil over the geocomposite and geomembrane by the CONTRACTOR shall be conducted in accordance with the requirements in Section 02220 Excavation, Backfilling, and Compaction.

<table>
<thead>
<tr>
<th>Property</th>
<th>Qualifier</th>
<th>Unit</th>
<th>Test Method</th>
<th>Specified Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>Minimum</td>
<td>mils</td>
<td>ASTM D 5199</td>
<td>330</td>
</tr>
<tr>
<td>Tensile Strength (machine direction)</td>
<td>Minimum</td>
<td>lbs/in</td>
<td>ASTM D 7179</td>
<td>100</td>
</tr>
<tr>
<td>Carbon Black</td>
<td>Range</td>
<td>percent</td>
<td>ASTM D 4218</td>
<td>2-3</td>
</tr>
<tr>
<td>Polymer Density, Resin</td>
<td>Minimum</td>
<td>g/cm³</td>
<td>ASTM D 1505</td>
<td>0.940</td>
</tr>
<tr>
<td>Polymer Melt Index</td>
<td>Maximum</td>
<td>g/10min</td>
<td>ASTM D 1238</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Qualifier</th>
<th>Unit</th>
<th>Test Method</th>
<th>Specified Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass per Unit Area</td>
<td>Minimum</td>
<td>oz/yd²</td>
<td>ASTM D 5261</td>
<td>6</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>Minimum</td>
<td>lbs</td>
<td>ASTM D 4632</td>
<td>160</td>
</tr>
<tr>
<td>CBR Puncture</td>
<td>Minimum</td>
<td>lbs</td>
<td>ASTM D 6241</td>
<td>435</td>
</tr>
<tr>
<td>Trapezoidal Tear Strength</td>
<td>Minimum</td>
<td>lbs</td>
<td>ASTM D 4533</td>
<td>65</td>
</tr>
<tr>
<td>Permittivity</td>
<td>Minimum</td>
<td>Sec⁻¹</td>
<td>ASTM D 4491</td>
<td>1.5</td>
</tr>
<tr>
<td>AOS</td>
<td>Maximum</td>
<td>sieve size(mm)</td>
<td>ASTM D 4751</td>
<td>#70 (0.212)</td>
</tr>
</tbody>
</table>
## TABLE 02561-3. GEOCOMPOSITE PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Qualifier</th>
<th>Unit</th>
<th>Test Method</th>
<th>Specified Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissivity (Note 1)</td>
<td>Minimum</td>
<td>m²/s</td>
<td>ASTM D 4716</td>
<td>3.8x10⁻³ (6 oz double sided)</td>
</tr>
<tr>
<td>Ply Adhesion</td>
<td>Average</td>
<td>lbs/inch</td>
<td>GRI GC7</td>
<td>1.0</td>
</tr>
<tr>
<td>Coefficient of Interface Friction w/ Geomembrane (Note 2) and w/ Protective Cover Soil (Note 3)</td>
<td>Minimum</td>
<td>degrees</td>
<td>ASTM D 5321</td>
<td>20.5°</td>
</tr>
</tbody>
</table>

Notes:

1. Per ASTM D 4716, one sample per 200,000 square feet, with a normal stress of 16,000 psf; water at 20°C (68°F); gradient of 0.02; profile of upper load plate, soil, composite, geomembrane, and lower load plate; and a test time period of 100 hours. Apply normal stress, under saturated conditions, for 1 hour minimum prior to start of test. Test data from the manufacturer using the identical testing configuration and parameter shall indicate that transmissivity values when tested in excess of 100 hours do not fall below the minimum value of Table 02561-3. Thickness of the core geonet must be monitored during application of the normal compressive load and flow testing. Report to provide hydraulic conductivity and transmissivity.

2. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. The testing criteria are as follows: The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 1 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, 8,000, and 16,000 psf. The strain rate is 1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 20.5 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

3. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the protective soil material. The testing criteria are as follows: The proposed protective soil material shall be prepared and molded to a minimum of 95% of the Standard Proctor (ASTM D 698). The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 24 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, and 8,000, and 16,000 psf. The strain rate is 1 mm/min (0.04 in/min). The minimum PEAK
interface friction angle shall be 20.5 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle

TABLE 02561-4. GEOCOMPOSITE JOINING METHODS

<table>
<thead>
<tr>
<th>Location</th>
<th>Layer</th>
<th>Joining Method</th>
<th>Min. Overlap</th>
<th>Tying Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll End (See Note 1)</td>
<td>Upper geotextile</td>
<td>Machine sewing</td>
<td>4&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Geonet</td>
<td>Nylon ties</td>
<td>6&quot;</td>
<td>2' on center</td>
</tr>
<tr>
<td></td>
<td>Lower geotextile</td>
<td>overlap</td>
<td>6&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Roll Side</td>
<td>Upper geotextile</td>
<td>Machine sewing</td>
<td>4&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Geonet</td>
<td>Nylon ties</td>
<td>4&quot;</td>
<td>5' on center</td>
</tr>
<tr>
<td></td>
<td>Lower geotextile</td>
<td>overlap</td>
<td>6&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>Repair of minor damage (See Note 2)</td>
<td>Upper geotextile</td>
<td>Machine sewing/ thermal bonding</td>
<td>12&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Geonet</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes:
1. At termination of geocomposite fold over upper geotextile as defined in Part 3.07.B.
2. Minor damage is defined in Part 3.09.B.
SECTION 02600

ROUNDED RIVER ROCK

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work specified in this section consists of supplying and installing rounded river rock material as shown on the plans and in the specifications.

B. Application Publications: All publications and standard specifications referred to herein are in the latest or current issue of that publication or specification as of specification date.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rounded River Rock: Rounded river rock shall consist of naturally occurring materials, such as gravel or granite. Dolomites, limestone and sandstone are not allowed:

   1. The rounded river rock shall consist of material having hard, strong, durable particles free of adherent coating. Rounded river rock shall have satisfactory soundness and satisfactory resistance to abrasion in accordance to AASHTO T104 and AASHTO T96: Satisfactory soundness will be considered to be a loss in weight of not greater than 15 percent when subjected to five alterations of the soundness test. Satisfactory resistance to abrasion will be considered to be a percentage of wear not greater than 55 percent.

B. Gradation Size: The rounded river rock shall be a N.C. D.O.T. standard size No. 57 or No. 5 stone meeting the following sizes

C. No. 57 Stone:

<table>
<thead>
<tr>
<th>Amount Finer (% By Weight)</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>95-100</td>
</tr>
<tr>
<td>¾</td>
<td>--</td>
</tr>
<tr>
<td>½</td>
<td>25-60</td>
</tr>
<tr>
<td>3/8</td>
<td>--</td>
</tr>
<tr>
<td>No. 4</td>
<td>0-10</td>
</tr>
<tr>
<td>Amount Finer (% By Weight)</td>
<td>Size</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>No. 8</td>
<td>0-5</td>
</tr>
</tbody>
</table>

D. No. 5 Stone:

<table>
<thead>
<tr>
<th>Amount Finer (% By Weight)</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>90-100</td>
</tr>
<tr>
<td>3/4</td>
<td>20-55</td>
</tr>
<tr>
<td>1/2</td>
<td>0-10</td>
</tr>
</tbody>
</table>

PART 3 EXECUTION

3.01 GENERAL

A. Certification: The Contractor is required to submit a letter of certification from the supplying quarry stating that the material supplied meets the requirements of this specification. The Contractor is also required to submit the supplier and source of the material.

B. Type Used: The type of rounded river rock used may be granite or other hard durable non-calcareous stone material, but the rock must have rounded edges with no sharp projection and only one type of material can be used throughout the project.

3.02 INSTALLATION

A. Procedures for placing rounded river rock around piping shall be in accordance with related sections.

END OF SECTION
PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide storm drainage systems consisting of culverts, and other drainage structures as shown on the Drawings and specified herein.

1.02 SUBMITTALS

A. Submit Shop Drawings, product data, certifications, etc. for the following items.
   1. Reinforced concrete piping and fittings
   2. Pipe certification

B. Submit product data and certification of quality by producers prior to installation.

1.03 JOB CONDITIONS

A. Existing Drainage System: Maintain operation, prevent siltation and flooding.

B. Cleanup: Maintain surface grade within 100 feet of pipe laying operation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Pipe: Reinforced concrete culvert pipe conforming to Division 10, Subarticle 1032-9(b) of the NCDOT Standard Specifications, unless otherwise indicated. Pipe joints shall be rubber gasket and shall conform to the requirements of Division 10, Subarticle 1032-9(F) of the NCDOT Standard Specifications.

B. Precast Concrete Units: Concrete for use in precast units shall be Class A. Joints shall be 0-ring rubber gaskets conforming to ASTM C443.

PART 3 EXECUTION

3.01 PREPARATION

A. Pipe Trenches:
   1. Pipe trenches shall be of necessary widths for the proper laying of the pipe and the banks shall be as nearly vertical as practicable with consideration
to soil conditions. The clearance between the pipe and trench wall shall be as indicated in Section 02220. The bottom of the trenches shall be excavated to a depth of the outside bottom of the pipe barrel. Any over excavation shall be replaced with suitable compacted material. Excavation for inlets and other appurtenances shall be sufficient to provide a clearance between their outer vertical surfaces and the face of the excavation or sheeting, if used, of not less than 12 inches.

2. Soft, spongy, or otherwise unstable material encountered below the established grade of the excavation which will not provide a firm foundation for subsequent work shall be removed and replaced as directed. Unless otherwise directed, all such unstable materials shall be removed for the full width of the excavation and replaced with approved fill material.

3. Where sheeting and bracing are necessary to prevent caving of the trench sidewalls of excavation for other structures, and to safeguard the workmen, the trench or excavation for other structures shall be dug to such width that the proper allowance is made for the space occupied by the sheeting and bracing to provide clearance as specified above.

3.02 INSTALLATION

A. Concrete Pipe:

1. Install concrete pipe carefully, true to the line and grade shown on the Drawings. Any deviation from true alignment or grade which would result in a displacement from the normal position of the gasket of as much as 1/4 inch, or which would produce a gap exceeding 1/2 inch between sections of pipe for more than 1/3 of the circumference of the inside of the pipe, will not be acceptable and where such occurs, remove and reinstall the pipe without additional compensation. Use no mortar, joint compound, or other filler that would tend to restrict the flexibility of the gasket joint. Install pipes having defects that have not caused their rejection so that these defects will be in the upper half of the sewer.

2. Installation of the pipe gasket, clean the gasket and the surface of the pipe joint, including the gasket recess free from grit, dirt, or other foreign matter. Application of an approved vegetable soap lubricant immediately prior to closing of the joint will be permitted.

3. Install all pipes with bells or grooves uphill. As the pipes are laid throughout the work, thoroughly clean and protect them from dirt and water. Lay no length of pipe until the two preceding lengths have been thoroughly embedded in place so as to prevent any movement or disturbance of the finished joint, and do not walk on or work over the pipes after they are laid, except as may be necessary in tamping earth and refilling, until they are covered to a depth of 1 foot. Place fill around the
pipe on both sides simultaneously to approximately the same elevation and uniformly compacted. Whenever the pipe laying is discontinued, as at night, protect the unfinished end from displacement due to caving of the banks or from other injury and insert a suitable stopper.

3.03 BACKFILLING FOR PIPE AND STRUCTURES

A. After the pipe has been installed, place approved select material from excavation at a moisture content which will facilitate compaction alongside the pipe in layers not exceeding 6 inches loose measure in depth. Thoroughly compact the fill under the haunches of the pipe and compact each layer by rolling or tamping with mechanical rammers. Continue this method of filling and compacting until the fill is 12 inches above the pipe, then place the remainder of the backfill in lifts not exceeding 9 inches. Operate heavy equipment in a manner so that no damage to the pipe will result. Compact backfill material 12 inches and more above the top of the pipe to not less than 90 percent Standard Proctor density as determined by ASTM D 698. Tests for density of compaction may be required at the option of the ENGINEER. Correct deficiencies without additional cost to the OWNER.

B. Place and compact backfill for drainage structures in the same manner as specified above for pipe, except allow the concrete to cure for not less than five days before placing the backfill.

END OF SECTION
SECTION 02726
TOE AND SUB DRAINS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work under this section includes all labor, material, tools and equipment required to lay toe and sub drains as shown in the Drawings.

1.02 SUBMITTALS

A. The CONTRACTOR shall submit to the ENGINEER the names of the pipe, pipe fitting, and certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair.

B. The CONTRACTOR shall submit to the ENGINEER for acceptance, complete, detailed shop drawings of all pipe and fittings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Piping for the Cell 7 toe drain will be 4-inch perforated HDPE as noted on the drawings.

B. Rounded River Rock: Rounded river rock shall consist of naturally occurring materials, such granite or other hard durable stone material. Dolomites, limestone and sandstone are not allowed:

1. The rounded river rock shall consist of material having hard, strong, durable particles free of adherent coating. Rounded river rock shall have satisfactory soundness and satisfactory resistance to abrasion in accordance to AASHTO T104 and AASHTO T96: Satisfactory soundness will be considered to be a loss in weight of not greater than 15 percent when subjected to five alterations of the soundness test. Satisfactory resistance to abrasion will be considered to be a percentage of wear not greater than 55 percent.

2. Gradation Size: Refer to Specification Section 02600-Rounded River Rock.

C. Geotextile: The geotextile shall be capable of withstanding direct exposure to sunlight for 30 days with no measurable deterioration. The non-woven geotextile products shall be a fabric of polypropylene monofilament yarns and inert to
commonly encountered chemicals, hydrocarbons, mildew and rot resistant, and be insect and rodent resistant. The geotextile products shall conform to Specification Section 02550-Geotextile.

PART 3 - EXECUTION

3.01 GENERAL

A. Certification: The CONTRACTOR is required to submit a letter of certification from the supplying quarry stating that the material supplied meets the requirements of this specification. The CONTRACTOR is also required to submit the supplier and source of the material.

B. Type Used: The type of rounded river rock used may be gravel or granite, but the rock must have rounded edges with no sharp projection and only one type of material can be used throughout the project.

3.02 PREPARATION

A. The CONTRACTOR shall install the toe drains in such a manner as to ensure the underlying layers are not damaged.

3.03 INSTALLATION

A. Laying Pipe: All pipe shall be carefully laid in conformity with the Drawings and in accordance with these specifications.

B. Connections to leachate cleanouts will conform to the drawings and details.

END OF SECTION
SECTION 02730

LEACHATE COLLECTION SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The WORK specified in this Section includes the installation of the leachate collection system, including the perforated and solid wall collection HDPE pipes and fittings, HDPE double wall forcemains, HDPE slope riser pipes, and related hardware as shown on the drawings and as specified herein.

B. Related Work Specified Elsewhere:
1. Section 02220 - Excavation, Backfill and Compaction.
2. Section 02550 - Geotextile
3. Section 02726 - Toe and Sub Drains
4. Section 11300 - Leachate Collection and Detection Pumps

1.02 SUBMITTALS

A. All product data shall be submitted, to the ENGINEER for approval, at least 7 calendar days prior to installation.

B. Names of the pipe, pipe fitting, and valve suppliers, certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair of each type of pipe and pipe fitting to be furnished.

C. Manufacturer's certification that the high density polyethylene (HDPE) pipe was manufactured from resins in compliance with these Specifications. The certificate shall state the specific resin, its source and the specific information required by ASTM 1248.

D. The HDPE pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. This stress regression testing shall have been done in accordance with ASTM D-2837, and the manufacturer shall provide a product supplying a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D-2837. The manufacturer must warrant the pipe to be free from defects in material and workmanship in accordance with ASTM D-3350 and F-714.

E. Manufacturer and model information for HDPE elbows and fittings in accordance with Part 2, this Section.

F. Details of elbows and fittings.
G. Backup rings and related hardware.

H. Flow meter manufacturer and model information.

I. Video inspection tape and report.

J. Leak testing report.

PART 2 PRODUCTS

2.01 HDPE PIPE AND FITTINGS (Polyethylene Force Mains, Leachate Sump Risers, Transducer Carrier Pipe, Cleanouts, and Leachate Collection Pipes)

A. High Density Polyethylene Pipe: The polyethylene pipe and pipe fittings shall be PE 3608 (formerly PE3408) high density polyethylene pipe. Minimum cell classification values shall be 345464C for color and stripes per ASTM D 3350; and shall be listed in the name of the pipe and fitting manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1,600 psi at 73F. The manufacturer shall certify that the materials used to manufacturer pipe and fittings meet these requirements. Polyethylene pipe shall be manufactured in accordance with ASTM F 714 and shall be so marked. Each production lot of material or pipe shall be tested for dimensions and ring tensile strength. The pipe shall be SDR 11 as noted on the drawings. The pipe shall be equal to "Driscopipe" as manufactured by Phillips Driscopipe, Inc., Richardson, Texas; Plexico, Franklin Park, Ill.; or equal.

B. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, and Standard Dimension Rating (SDR).

C. All HDPE pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same manufacturer's specification as the raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index and other physical properties.

D. Pipe and perforations shall be of sizes as shown on the Drawings. Pipe shall be furnished in standard laying lengths.

E. Pipe shall be furnished perforated or non-perforated as specified and in the locations shown on the Drawings.

F. Fittings: All HDPE fittings, including reducing tees, cross tees, and elbows shall be factory molded and/or fabricated with butt fusion. All fittings shall meet the requirements of ASTM D-3261 and F-714.
G. Threaded HDPE plugs at each cleanout, as shown on the Drawings, and one socket adapter shall be provided.

H. Fitting at Leachate Sump Riser Pipe - The 24-inch nominal diameter fitting connecting the HDPE leachate riser pipe and the leachate sump pipe shall be fabricated from HDPE meeting the specifications in Section 2.01 Pipe and Fittings and shall be equivalent to Phillips Driscopipe 1000 with an SDR of minimum 11. The manufacturer of the fitting shall determine after consulting the manufacturer of the leachate pumps, and provider of the HDPE riser pipe and sump pipe, the angle at which the fitting needs to achieve, and how the fitting will be fabricated to achieve the desired deflection angle. The fitting shall be constructed to allow the leachate pumps to be removed and replaced freely without the pump, discharge piping or motor leads being damaged.

I. Miscellaneous Materials: Additional items of construction such as cleanout-outs, toe drains, transducer pipes and other items necessary for the complete installation of the system shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these specifications.

2.02 CORREGATED PLASTIC PIPE (STORMWATER DRAINAGE)

Stormwater drainage culvert pipe shall be corrugated, smooth interior wall Model N-12, polyethylene pipe as manufactured by ADS, Inc., or Engineer-approved substitute.

A. Pipe manufactured for this specification shall comply with and have certified requirements for test methods, dimensions and markings found in AASHTO M294 and MP7, current editions. Pipe and fittings shall be made from virgin PE compounds which conform to the requirements of cell class 335400C with SP-NCTL @ 15%/24hr as defined and described in ASTM D3350.

B. Nominal sizes for this specification include 12– 48 inch and 60-inch diameters designated as AASHTO Type “S” (N-12) as full circular cross-section with an outer corrugated pipe wall and essentially smooth inner wall (waterway). Corrugations for AASHTO Type “S” shall be annular (N-12).

C. Joints for this specification shall consist of in-line integral bell and spigot with rubber gasket that meets specification requirements of ASTM F477. Bell shall span over three spigot corrugations. Annular Type “S” (N-12) pipe has both Soil Tight and Water Tight joint designs. Soil Tight (N-12) pipe joints are designed to meet a laboratory pressure test of at least 2-psi following ASTM D-3212. Water Tight (N-12 WT) pipe joints are designed to meet a laboratory pressure test of at least 10.8-psi following ASTM D-3212.

D. Fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings such as couplers and reducers, branch assembly fittings such
as tees wyes and end caps. Couplers shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the manufacture shall be used.

E. Installation for this pipe specification shall be in accordance with ASTM D2321 and as recommended by the manufacture.

F. All high density polyethylene (HDPE) pipe used for culvert and storm drain applications shall conform to the requirements of AASHTO M294 current edition and be certified through the Plastics Pipe Institute (PPI) Third Party Certification program. All HDPE pipe delivered and used shall bear the Third Party Administered PPI seal.

G. The latest revisions of the following standards are applicable as noted herein:

   ADS STD-101: Manufacture’s recommended Trench Installation Detail.

2.03 BACK-UP RING

A. Back-up ring shall be stainless steel, Type 316, plate type ANSI B16.5-B1, Class 150 pound. The boltheads and nuts for the back-up ring shall be hexagonal with machine threads manufactured of hot dipped stainless steel. Stainless steel flat washers shall be used. All back-up ring shall have 1/8-inch think gaskets made of Hypalon.

2.04 PERFORATIONS

A. As indicated on the drawings.

B. As installed, the pipe shall be aligned and placed so that the perforations are at the bottom of the pipe along the trench.
2.05 VALVES AND METERS

A. All PVC ball valves sizes 3/8 inches through 6” shall be of true union design with two way blocking capability. As a safety feature, the valves shall have a blow out proof stem with double stem seals. All o-rings shall be either EPDM or FPM and the valve seats shall be PTFE with an elastomeric backing of the same material as the valve seals. The valve shall be of floating ball design with full schedule 80 bore (except for 6” venturied). All ball valves shall have an adjustable seat carrier that can be adjusted or removed using the valve handle as a spanner wrench. On sizes 3/8” - 2”, all ball valves shall be supplied with both socket and threaded end connectors. PVC shall conform to ASTM D1784, classification 12454-B. The valve shall have a pressure rating up to 225 psi at 68F. 10” gate valves on the forcemain will be leachate resistant and installed as per detail on the drawings.

B. Leachate flow meters: See Section 11300 Leachate Collection and Detection Pumps.

PART 3 EXECUTION

3.01 TRANSPORTATION, HANDLING, AND STORAGE

A. Transportation: Care shall be taken not to cut, kink or otherwise damage the pipe material during transportation.

B. Handling:

1. Ropes, fabric or rubber-protected slings and straps shall be used when handling pipe materials.

2. Chains, cables, or hooks inserted into the pipe ends shall not be used. A sling with a spreader bar shall be used for lifting each length of pipe section. Pipe materials shall not be dropped or dragged on rocky or rough ground.

C. Storage:

1. Pipe materials shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage them in accordance with manufacturer’s recommendations.

2. Stacking of the pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions.

3. Where necessary due to ground conditions, the pipe shall be stored on wooden pallets and supported to prevent deformation of the pipe.
D. Pipe material which is damaged by the CONTRACTOR shall be replaced at no additional cost to the OWNER.

3.02 EXCAVATION AND BACKFILL

A. All excavation in the preparation of horizontal access pipe shall be performed in accordance with the requirements of Section 02220 - Excavation, Backfilling, and Compaction.

3.03 INSTALLATION

A. The installation of HDPE pipe and fittings shall be strictly in accordance with the manufacturer's technical data and printed instructions, at locations shown on the Drawings and as specified herein. All heat fusion joints shall be done by factory qualified fusion technicians.

B. The CONTRACTOR shall use accepted industry practice in unloading and stockpiling material. HDPE pipe shall never be dumped or dropped from a truck bed. HDPE pipe shall be lifted and placed on the ground, or rolled down ramps. HDPE pipe and other materials shall never be dragged along the ground.

C. The CONTRACTOR shall stockpile material only in areas authorized by the ENGINEER. Material stockpiled in an unauthorized area shall be moved by CONTRACTOR at no cost to the OWNER. CONTRACTOR shall stockpile material to insure even and complete support for the material to prevent crimping, marring, crushing, piercing, or other damage. Maximum stacking height shall be limited to 6 feet. CONTRACTOR supplied material which is damaged shall be replaced at no additional cost to the OWNER.

D. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will over stress or buckle the HDPE piping or impose excessive stress on the joints.

E. Pipe shall be laid to line and grade, and with bedding and backfill material as shown on the Drawings.

F. When laying is not in progress (including break times) the open ends of the pipe shall be closed by fabricated plugs, or by other approved means. All plugs shall be outside diameter fitting plugs. No plugs will be allowed that require insertion of the plug into the pipe. Any sediment or other contaminants allowed to enter pipe by failure to place cap over end shall be removed at CONTRACTOR's expense.

G. Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of
Section 4.0 - Construction of Collector System

cuts, scratches, or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges, or scratches.

H. Sections of pipe with cuts, scratches or gouges deeper than recommended as acceptable by manufacturer shall be replaced at CONTRACTOR's expense.

I. HDPE pipes joined using mechanical couplings:

1. Mechanical joints shall be made in accordance with manufacturer's recommendations. Coupling equipment and trained operator will be provided by CONTRACTOR.

2. HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.

3. Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.

4. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.

J. HDPE pipes joined using fusion welding:

1. Fusion joints shall be made in accordance with manufacturer's recommendations. Coupling equipment and trained operator(s) shall be provided by CONTRACTOR.

2. HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.

3. Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.

4. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.

K. HDPE pipe installation:

1. Lengths of fused pipe (4 inches in diameter or greater) to be handled as one section shall not exceed 400 feet.

2. HDPE pipe shall be allowed sufficient time to adjust to foundation soil temperature prior to any testing, segment tie-ins, and/or backfilling.
3. The stubends, with stainless steel back-up ring, shall be fusion welded to the pipe as shown on the Drawings. Field fabricated bends conforming to the contours and grades of the cell shall be fabricated in the field.

L. The ENGINEER shall be notified prior to any pipe being installed. The ENGINEER will inspect the following items at this time:

1. All mechanical and butt-fusion joints.
2. Pipe integrity.
3. Pipe foundation for rocks and foreign material.
4. Proper trench or foundation slope.
5. Trench or foundation contour to ensure the pipe will have uniform and continuous support.

Any irregularities found by the ENGINEER during this inspection must be corrected by CONTRACTOR before lowering the pipe into the trench or otherwise covering the pipe.

M. Damaged pipe that results in a reduction of the wall thickness beyond 10 percent shall be cut out and discarded. Damaged pipe shall be repaired according to manufacturer’s recommendation, and at no additional cost to the OWNER.

N. Protection of the Geomembrane:

1. During installation of geotextile, rock, or pipe, no equipment shall be used that may damage the geomembrane.

O. Areas of the geomembrane that will be exposed to traffic or other activities shall be protected by geotextiles, additional geomembrane, or other suitable materials. Any portion of the liner which becomes damaged or shows signs of excessive wear shall be replaced at no additional cost to the OWNER.

3.04 INSTALLING VALVES

A. The installation of valves and appurtenances shall be strictly in accordance with manufacturer's technical data and printed instructions, at locations shown on the drawings and as specified herein. All valves shall be butt fused into the line.

3.05 MECHANICAL CONNECTIONS

A. Mechanical connections of the HDPE pipe to auxiliary equipment through flanged connections such as manholes, shall consist of the following:
1. All stub ends and flange connections shall be thermally butt-fused to the ends of the pipe.

2. A metal back-up ring shall be stainless steel, Type 316 and be sized to ANSI B16.5-B1, Class 150 pound outside diameter and drillings.

3. Studs (Thread-rod), not bolts, shall be stainless ASTM A-354 to connect flanges. All studs shall be coated, just prior to installation, with an nickel based anti-seize compound to prevent galling and corrosion. Loctite Nickel Anti-Seize or ENGINEER approved substitution.

B. Other mechanical couplings such as 360 degree full circle clamps can be used only as approved by the ENGINEER.

3.06 HYDROSTATIC LEAK TESTING

A. Following assembly all pipelines installed under this section shall be leak tested.

B. The test pressure shall be 100 psi.

C. Hydrostatic leak test procedure consists of filling, an initial expansion phase, a test phase, and depressurizing.

1. Filling: The restrained test section shall be completely filled with test liquid. Ensure that no air is trapped in the test section. Failure with entrapped air can result in explosive release.

2. Initial Expansion Phase: Gradually pressurize the test section to test pressure, and maintain test pressure for three hours. During initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

3. Test Phase: Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid. If test pressure remains steady (within 5% of the target value) for one hour, no leakage is indicated.

D. Depressurizing: At the conclusion of the test, the test section shall be depressurized by the controlled release of fluid from the test section.

3.07 INTERIM CLEANING

A. Care shall be exercised during fabrication to prevent the accumulation of dirt, pipe cuttings and filings, gravel, cleaning rags, etc. within piping sections. All piping shall be examined to assure removal of these and other foreign objects prior to assembly.
3.08 FINAL CLEANING AND VIDEO INSPECTION

A. Following assembly and testing and prior to final acceptance, all pipelines installed under this section, shall be flushed with water and all accumulated construction debris and other foreign matter removed. Flushing velocities shall be a minimum of 2.5-feet per second. Cone strainers shall be inserted in the connections to attached equipment and shall remain in place until cleaning is accomplished to the satisfaction of the ENGINEER. Accumulated debris shall be removed through fittings or appurtenances.

B. Upon completion of installation, all leachate collection and detection systems installed under this section shall be videoed by the CONTRACTOR. The video shall be submitted to the ENGINEER electronically and on a single USB 3.0 flash drive.

3.09 CERTIFICATION OF COMPLETION

A. Upon completion of the covering operation over the pipe, the CONTRACTOR shall certify in writing the following to the ENGINEER:

1. The piping system has been constructed in accordance with the approved project plans and specifications.

B. The piping system has not been damaged during construction or the backfilling operation.

END OF SECTION
SECTION 02776
GEOSYNTHETIC CLAY LINER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The CONTRACTOR shall furnish all labor, transportation, materials, supervision, administration, management, quality control and installation equipment necessary for the manufacturing, storage, delivery, installation and testing of a geosynthetic clay liner (GCL) portion of the liner system, as herein specified and as shown on the Drawings. The supply and installation of these materials shall be in strict accordance with the ENGINEER's Specifications and Drawings and the MANUFACTURER's instructions and be subject to the terms and conditions.

2. All material shall conform to the following requirements and shall be of new stock of the highest grade available, free from defects, and recently manufactured.

3. All installation shall be in conformance with the MANUFACTURER’s recommendations and with current industry standards.

4. All WORK shall be performed in strict accordance with the lines, grades, cross-sections, and dimensions as shown on the Drawings.

1.02 APPLICABLE STANDARDS OR REFERENCES

A. The following American Society of Testing and Materials (ASTM) test methods shall be incorporated into this specification in their entirety, subject to the indicated test modifications:

ASTM D 4643 - “Determination of Water (Moisture) Content of Soil by the Microwave Oven Method”
ASTM D 5261 - “Standard Test Method for Measuring Mass Per Unit Area of Geotextiles”
ASTM D 5321 - “Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method”
ASTM D 5887 - “Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter”
1.03 QUALIFICATIONS

A. GCL MANUFACTURER Qualifications:

1. Qualified GCL MANUFACTURER’s shall be a company, corporation, or firm regularly engaged in the development and manufacture of GCL's with a history of successful production of GCL's for a minimum period of three (3) years. The GCL MANUFACTURER must have produced at least 10 million square feet of GCL. The MANUFACTURER shall submit written information as follows:

   a. Corporate background and information.

    b. Manufacturing capabilities including:

       1) Information on plant size, equipment, qualified personnel, number of shifts per day, and capacity per shift.

       2) Daily production quantity with sufficient production capacity available to meet the demands of the project schedule for this contract.

       3) Quality control procedures (manual) for manufacturing.

       4) List of material properties including certified test results, to which GCL material samples are attached.
B. GCL Installer Qualification:

1. The GCL INSTALLER must either have installed at least 1 million square feet of GCL, or must provide to the ENGINEER satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed satisfactorily. The GCL INSTALLER shall submit three project references with written information as follows:

   a. Name of location of project and date of installation;
   b. Contact name and phone number for each project; and
   c. GCL type and surface area installed.

1.04 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) shall be performed by the GCL INSTALLER. The GCL INSTALLER’s responsibilities shall include, but not be limited to:

1. Supervise all GCL installation activities.

2. Perform and document quality control testing as specified herein.

3. Certify GCL materials and installation as meeting requirements of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by a designated CQA CONSULTANT retained by the OWNER. The CQA CONSULTANT, or his CONSTRUCTION QUALITY ASSURANCE (CQA) REPRESENTATIVE, shall observe and inspect the GCL installation activities and conduct CQA testing at a random frequency and location. The CQA CONSULTANT shall submit a final report, signed and sealed by a professional engineer licensed in the State of North Carolina, certifying the test results.

C. Based upon review of the CQC and CQA final reports, the CQA CONSULTANT will provide certification to the regulatory agencies that the GCL was installed in accordance with the Contract Documents.

D. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the GCL and shall keep the CQC/CQA CONSULTANT’s laboratory informed of the construction progress to provide sufficient time for laboratory testing.
1.05 SUBMITTALS

A. GCL MANUFACTURER’s Qualifications.

B. INSTALLER’s Qualifications.


D. The GCL shall be tested for the parameters and requirements listed on Table 1 to evaluate stress deformation characteristics. This testing shall be performed by the MANUFACTURER or the MANUFACTURER’s certified testing laboratory. Samples which do not satisfy the Contract Specifications shall be cause to reject applicable rolls. If a GCL sample fails to meet specifications, subsequent tests shall be performed at random on additional GCL samples produced from the same batch to determine whether all rolls produced from the same batch shall be regarded as unsatisfactory and therefore, rejected. This additional testing, at the MANUFACTURER’s discretion and expense, may be performed to more closely identify the rolls that do not comply with the Specifications.

E. The tests specified on Table 1 shall be performed by the MANUFACTURER or MANUFACTURER’s testing laboratory for the material to be delivered and installed. Samples shall be taken across the entire width of the rolls. The averaged test results of the GCL samples shall meet or exceed the specifications on Table 3. Certifications of the test results obtained shall be provided to the ENGINEER and recorded on the Quality Control Certificates.

**TABLE 1. GCL MANUFACTURING QUALITY CONTROL TESTING**

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</tbody>
</table>

F. The MANUFACTURER shall provide the ENGINEER with the MANUFACTURER Quality Assurance/MANUFACTURER Quality Control (MQA/MQC) Certifications for each shipment of GCL. The Certifications shall be signed by a responsible party employed by the MANUFACTURER such as the MQA/MQC Manager, Production Manager, or Technical Services Manager. The MQA/MQC Certifications shall include:

1. GCL lot and roll numbers (with corresponding shipping information).
2. The results of MQA/MQC testing performed by the MANUFACTURER. At a minimum, the following tests shall be performed by the MANUFACTURER:

G. The CONTRACTOR shall submit to the ENGINEER a physical sample of the GCL used in the final construction. The samples shall be labeled with MANUFACTURER’s name, product identification, lot number and roll number.

H. The MANUFACTURER shall provide, in writing, the proper size equipment, loading, unloading, and handling procedures for all products delivered to the project.

I. The MANUFACTURER shall provide proper storage procedures for keeping the GCL from being damaged or pre-hydrated by weather or outdoor exposure.

J. The date of shipment of GCL from the MANUFACTURER. A minimum of 30 days shall be provided to the ENGINEER so as to provide sufficient time to perform conformance sampling and receive laboratory test results prior to material shipment.

K. Direct Shear Test Results (Interface Shear Resistance): The OWNER shall provide Direct Shear Test Results tests demonstrating compliance with Part 2.01(G).

L. Direct Shear Test Results (Interface Shear Resistance): OWNER shall provide Direct Shear Test Results tests demonstrating compliance with Part 2.01(H).

M. Direct Shear Test Results (Internal Shear Resistance): OWNER shall provide Direct Shear Test Results tests demonstrating compliance with Part 2.01(I).

N. GCL Installation Plan as submitted by the INSTALLER for approval at least 14 days prior to delivery of the GCL materials to the site.

O. Prior to GCL installation, the INSTALLER shall submit a Certification of Subsurface Acceptability signed by the GCL INSTALLER and the CQA REPRESENTATIVE.

P. Prior to GCL installation, the CONTRACTOR shall supply the ENGINEER with survey data that clearly indicates the grades and elevation meet the project specifications.

Q. Provide MANUFACTURER’s extended warranty or guarantee, with OWNER named as beneficiary, in writing for the following listed below:

1. Unless otherwise stated in this Specification, the CONTRACTOR shall guarantee the materials of all products supplied on a prorated basis as a part of this work for a minimum period of fifteen (15) years following Final
Acceptance by the OWNER. The CONTRACTOR shall repair or replace, at no additional expense to OWNER or ENGINEER, any defective materials or products that fail to meet the design requirements. Repair or replacement of such defective material and/or products shall be completed within thirty (30) calendar days of notification by the OWNER.

2. Unless otherwise stated in this Specification, the CONTRACTOR shall guarantee the workmanship of all services supplied as part of this work for a minimum period of two (2) years following acceptance by the OWNER. The CONTRACTOR shall repair or replace, at no additional expense to OWNER or ENGINEER, any defective work that fails to meet the design requirements. Repair or replacement of such defective work shall be completed within thirty (30) calendar days of notification by the OWNER.

3. Warranty conditions proposed by the MANUFACTURER/INSTALLER concerning limits of liability will be evaluated upon receipt and must be acceptable to the OWNER prior to installation of the GCL. Proposed Warranty Conditions shall be submitted to the ENGINEER within twenty-one (21) contract days after Award of Contract for review and acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The GCL shall be comprised of new, first-quality products designed and manufactured specifically for the purpose intended. The GCL shall be a factory manufactured hydraulic barrier consisting of sodium bentonite clay supported by geotextiles that are held together by needling. The GCL shall have the properties necessary to achieve compliance with the requirements in this Specification.

B. The GCL shall be the following, or an ENGINEER-approved equal, if it can be documented that the material meets or exceeds these specifications:

- BentoLiner NWL-35 as manufactured by GSE Environmental or
- CETCO Bentomat DN

C. GCL shall be manufactured so that bentonite shall be continuously contained throughout the GCL and to support geotextile so that no displacement of bentonite occurs when material is unrolled, moved, cut, torn, or punctured. Encapsulating geotextile materials shall protect bentonite and be sufficiently porous to allow bentonite flow-through to create positive bentonite-to-bentonite seal at seams.

D. The GCL shall be produced free of holes, blisters, or contamination by foreign matter. Rolls manufactured with inclusions, bubbles, or not complying with the Specifications shall be rejected and not delivered to the project.
E. Any accessory bentonite used for sealing seams, penetrations, or repairs, shall be the same granular bentonite as used in the production of the GCL itself with the properties listed below:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>ASTM TEST METHOD</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell Index</td>
<td>D 5890</td>
<td>24 ml/2g (min)</td>
</tr>
<tr>
<td>Moisture Content</td>
<td>D 4643</td>
<td>12% (max)</td>
</tr>
<tr>
<td>Fluid Loss</td>
<td>D 5891</td>
<td>18 ml (max)</td>
</tr>
</tbody>
</table>

F. Panels of bentonite and encapsulating geotextiles manufactured shall perform as a continuous lining. The finished GCL shall have the physical properties listed below:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>ASTM TEST METHOD</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite Mass/Area</td>
<td>D 5993</td>
<td>0.75 (at 0% moisture) (psf)</td>
</tr>
<tr>
<td>Non-woven Cover Geotextile Weight</td>
<td>D 5261</td>
<td>6 (oz/sq yd)</td>
</tr>
<tr>
<td>Grab Strength</td>
<td>D 4632</td>
<td>150 lb MARV</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>D 6768</td>
<td>45 lb/in MARV</td>
</tr>
<tr>
<td>Peel Strength</td>
<td>ASTM D 6496</td>
<td>5.3 lb/in min</td>
</tr>
<tr>
<td>Index Flux at 5 psi effective confining stress and 2 psi head using de-aired tap water</td>
<td>D 5887</td>
<td>&lt; 1 x 10^{-8} cm/sec</td>
</tr>
<tr>
<td>Permeability with landfill leachate under 16,000 psf normal load</td>
<td>D 5887</td>
<td>5 x 10^{-11} m/sec max</td>
</tr>
<tr>
<td>Finished GCL Roll Width</td>
<td>Linear Measurement</td>
<td>15.5 ft</td>
</tr>
<tr>
<td>Finished GCL Roll Length</td>
<td>Linear Measurement</td>
<td>150 ft</td>
</tr>
</tbody>
</table>

G. Direct Shear Test (Interface Shear Resistance): The CONTRACTOR will perform one (1) direct shear test, in accordance with ASTM D 5321, on representative samples of the GCL/Sub-base to be provided for this project. If the interface doesn’t meet the requirements or the CONTRACTOR changes the material, then the additional cost to qualify those materials shall be borne by the CONTRACTOR. The following testing parameters will be followed for the direct shear testing with the results submitted to the ENGINEER:

1. Testing to be conducted under fully saturated (water) conditions, the material will be hydrated under normal load.
2. Three Normal Loads = 1,000, 8,000, and 16,000 psf.
3. Strain Rate = 0.040 in/min.
4. Continue testing to ensure a full 3-inch of displacement.
5. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.
6. A minimum PEAK value of 0 psf adhesion and 20.5 degrees friction is required for this project (based upon the best fit line).
7. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

H. Direct Shear Test (Interface Shear Resistance): The CONTRACTOR will perform one (1) direct shear test, in accordance with ASTM D 5321, on representative samples of the GCL/Geomembrane (textured) to be provided for this project. If the interface doesn’t meet the requirements or the CONTRACTOR changes the material, then the additional cost to qualify those materials shall be borne by the CONTRACTOR. The following testing parameters will be followed for the direct shear testing with the results submitted to the ENGINEER:

   1. Testing to be conducted under fully saturated (water) conditions, the material will be hydrated under normal load.
   2. Three Normal Loads = 1,000, 8,000, and 16,000 psf.
   3. Strain Rate = 0.040 in/min.
   4. Continue testing to ensure a full 3-inch of displacement.
   5. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.
   6. A minimum PEAK value of 0 psf adhesion and 20.5 degrees friction is required for this project (based upon the best fit line).
   7. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

I. Direct Shear Test (Internal Shear Resistance): The CONTRACTOR will perform one (1) direct shear test, in accordance with ASTM D 5321, on a representative sample of the GCL to be provided for this project with the results submitted to the ENGINEER. GCL shall have a PEAK internal friction angle of 20.5 degrees and as determined in the laboratory using ASTM D 5321, under fully hydrated conditions, and a confining pressure loading of 1,000, 6,000, and 16,000 psf.

J. The CONTRACTOR shall perform three (3) permeability tests and three (3) compatibility tests according to ASTM D 5887 and EPA 9100 each on representative sample of the GCL using leachate and groundwater from the Landfill prior to shipment of the GCL material to the project site. The CONTRACTOR will obtain up to 50 gallons each of leachate from the OWNER’S Landfill and onsite groundwater for the testing. GCL must meet the permeability requirements stated above for the finished GCL for tests with leachate and groundwater. CQC Consultant shall issue a certified detailed report in accordance with ASTM D 5887/D 6766 to the ENGINEER.

2.02 CONFORMANCE TESTING (CQA)

A. In-Plant Conformance Sample Testing Services. The OWNER and OWNER’S REPRESENTATIVE have CQA REPRESENTATIVEs to collect conformance samples directly at the following facilities:
B. The CONTRACTOR shall inform, in writing, the ENGINEER 14 days prior to the actual date of shipment of material to the site.

C. Conformance sample(s) of the GCL will be collected and tested by the OWNER’S REPRESENTATIVE or CQA CONSULTANT, prior to shipment to the site. Conformance sample(s) of the GCL will be tested by the CQA CONSULTANT prior to shipment to the site. If the material is shipped to the project and does not meet the project specifications, then all cost associated with collecting, testing, and shipping samples from the project will be the CONTRACTOR’s responsibility.

D. Conformance Sample Test Frequency (CQA). The GCL shall be randomly sampled by the OWNER’S REPRESENTATIVE prior to delivery of material to the project site. The initial conformance testing shall be at the OWNER’S expense. The initial conformance tests shall include the following:

1. Mass Per Unit Area (ASTM D 5993) - One test per 40,000 square feet.
2. Bentonite Swell Index (ASTM D5890) - One test per 100,000 square feet.
3. Permeability (ASTM D 5887) - One test per 100,000 square feet.
4. Grab Strength (ASTM D 4632) - One test per 100,000 square feet.

E. Samples which do not satisfy the Specifications shall be cause to reject applicable rolls.

PART 3 -EXECUTION

3.01 LABELING, PACKING

A. Each GCL roll shall be individually packaged in moisture resistant plastic sleeves and protected to prevent damage during shipment. The cardboard cores shall be sufficiently strong to resist collapse during transit and handling.

B. Prior to shipment, the MANUFACTURER shall label each roll, both on the GCL roll and on the surface of the plastic protective sleeve. Labels shall be resistant to fading and moisture degradation to ensure legibility at the time of the installation. Each package shall be prominently identified in the same manner as the product within and showing the date of shipment. At a minimum each roll label shall identify the following characteristics:

1. Product identification information (manufacturer name and address, brand name, product code).
2. Product lot number and individual roll number.

3. Date of fabrication.

4. Roll length and width.

5. Total roll weight.

6. Proper direction of unrolling and/or unfolding to facilitate layout and positioning in field.

C. All GCL rolls shall be labeled and bagged in packaging that is resistant to degradation by ultraviolet (UV) light, and is moisture resistant.

3.01 DELIVERY, STORAGE AND HANDLING

A. The MANUFACTURER shall identify, in writing, the proper equipment and methods for loading, shipping, and unloading materials to the project.

B. The MANUFACTURER shall provide, in writing, the proper storage procedures for the products delivered to the site.

C. The CONTRACTOR shall provide the proper equipment and labor necessary to unload the material upon delivery to the project.

D. GCL must be supported during handling to ensure worker safety and to prevent damage. Under approved circumstances only, shall the rolls be dragged, lifted from one end, lifted with only the forks of a lift truck or pushed to the ground from the delivery vehicle.

E. Each GCL roll shall be visually inspected by the CONTRACTOR when unloaded to determine if any packaging or material has been damaged during transit.

F. Rolls of GCL exhibiting damage shall be marked and set aside for closer examination during deployment.

G. Do not remove the plastic wrapping until deployment. Minor rips or tears in the plastic packaging shall be repaired with moisture resistant tape prior to being placed in storage to prevent moisture damage.

H. GCL rolls delivered to the project site shall be only those indicated on GCL manufacturing quality control certificates.

3.02 STORAGE / STOCKPILING / STAGING

A. Storage of the GCL rolls shall be the responsibility of the CONTRACTOR. The materials shall be unloaded by the CONTRACTOR in areas designated by the
OWNER. If the OWNER has not specified a storage area, the CONTRACTOR shall determine an area for storage of the materials to meet the WORK schedule requirements. In any case the materials shall not be stored or unloaded in areas that will impair the operations of the landfill facility or be deleterious to the materials.

B. All GCL rolls shall be stored and maintained dry in a flat location area away from high-traffic areas but sufficiently close to the active WORK area to minimize handling.

C. The presence of free-flowing water within the GCL packaging will require that roll to be set aside for further examination to ascertain the extent of damage. Free-flowing water within the GCL packaging shall be cause for rejection of that roll by the ENGINEER.

D. GCL shall be stored no higher than three to four rolls high or limited to the height at which the handling apparatus may be safely handled by installation personnel. Stacks or tiers of rolls should be situated in a manner that prevents sliding or rolling by “choking” the bottom layer of rolls.

E. Rolls shall not be stacked on uneven or discontinuous surfaces in order to prevent bending, deformation, damage to the GCL or cause difficulty inserting the core pipe.

F. An additional tarpaulin or plastic sheet shall be used over the stacked rolls to provide extra protection for GCL material stored outdoors.

G. Bagged bentonite material shall be stored and tarped next to GCL rolls unless other more protective measures are available. Bags shall be stored on pallets or other suitably dry surface which will prevent undue prehydration until installation.

3.03 GCL SUB-BASE PREPARATION

A. Surface to be lined with GCL shall be smooth and tested as shown on the Contract Drawings. The area shall be free of all rocks (greater than 1/4-inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, grass, refuse, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the GCL with no sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

B. The area upon which the GCL material will be installed shall be inspected by the CQA REPRESENTATIVE and certified by the GCL INSTALLER to be in accordance with the requirements of this specification.
C. It shall be the INSTALLER’s responsibility to indicate to the ENGINEER any change in the condition of the subgrade that could cause the subgrade to be out of compliance with any of the requirements of this section or the project specification rendering the GCL unacceptable for deployment.

D. All areas that have been subject to erosion shall be repaired and tested in place as shown on the drawings. The repaired surface for GCL placement shall be even with no abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

3.04 GCL PLACEMENT

A. Placement of the GCL shall be conducted in accordance with the MANUFACTURER’s recommendations and with the direction provided herein. Any deviations from these procedures must be reviewed and accepted by the ENGINEER prior to construction.

B. The use of equipment capable of freely suspending the GCL roll is required. A spreader bar and core pipe are also required for supporting the roll and allowing it to unroll freely. The core pipe and spreader bar shall not bend or flex excessively when a full roll is lifted.

C. Where possible, all slope panels should be installed parallel to the maximum slope while panels installed in flat areas require no particular orientation.

D. Deployment should proceed from the highest elevation to the lowest to facilitate drainage in the event of precipitation.

E. Deployment on flat areas shall be conducted in the same manner as that for the slopes, however, care should be taken to minimize “dragging” the GCL. Slip-sheet may be used to facilitate positioning of the liner while ensuring the GCL is not damaged from underlying sources.

F. Panels shall be placed free of tension or stress yet without wrinkles or folds. It is not permissible to stretch the GCL in order to fit a designated area.

G. Panels shall not be dragged across the subgrade into position except where necessary to obtain the correct overlap for adjacent panels.

H. Panels shall not be placed during adverse weather conditions, including rain, high wind, or any other weather conditions which might be deleterious to the subgrade, materials, or the installation. GCL shall be “dry” when installed and “dry” when HDPE geomembrane is installed over it.
I. The CONTRACTOR shall unwrap and install only as much GCL in one working
day as can be covered with a geomembrane. In no case shall the GCL be exposed
to the elements at the end of the day.

J. Cover as soon as possible to protect the GCL from hydration, environmental
effects and damage. Do not allow vehicles in direct contact with the deployed
GCL.

K. Remove and replace panels hydrated or partially hydrated without geomembrane
cover.

L. Minimize cutting GCL. Whenever possible, overlap instead of cutting material.
If cutting is required, cut GCL with a cutter or other approved device. Seal all cut
edges, as recommended by the MANUFACTURER, to prevent loss of bentonite.
Protect adjacent materials from potential damage due to cutting of GCL.

3.05 GCL PANEL SEAMING

A. All GCL seams shall be formed in accordance with the MANUFACTURER’s
recommendations.

B. A 6-inch lap line and a 9-inch match line shall be imprinted on both edges of the upper
gotextile component of the GCL to assist in installation overlap quality control.
Lines shall be printed as continuous dashes in easily observable non-toxic ink.

C. Overlap seams shall be a minimum of six inches on panel edges and one foot on panel
ends. The lap line and match lines printed on the panels shall be used to assist in
obtaining this overlap.

D. The edges of the GCL panels should be adjusted to smooth out any wrinkles, creases,
or “fishmouths” to maximize contact with the underlying panel.

E. All GCL seams shall be formed by executing a bentonite-enhanced overlap to ensure
that a continuous seal is achieved between panels. After the overlying panel is placed,
its edge shall be pulled back to expose the overlap zone. Any soil or debris present in
the overlap zone or entrapped in the geotextiles shall be removed. A fillet of granular
bentonite shall then be poured in a continuous manner along the overlap zone
(between the edge of the panel and the 6-inch line) at a rate of at least one-quarter
pound per linear foot to ensure that a continuous seal is achieved between panels.

3.06 DAMAGE REPAIR

A. Prior to cover material placement, damage to the GCL shall be identified and repaired
by the INSTALLER. Damage is defined as cuts, rips or tears in the geotextiles,
delamination of geotextiles, displaced panel or hydrated areas in the GCL.
B. Rips or tears on flat and sloped surfaces may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch cut from unused GCL over the damage (damaged material may be left in place), with a minimum overlap of 12 inches on all edges. Accessory bentonite shall then be placed between the patch edges and the repaired material at a rate of one-quarter pound per lineal foot of edge spread in a continuous six inch fillet, and the patch shall be placed over the area. An epoxy-based adhesive shall be used to keep the patch in position during backfill operations.

C. Displaced panels shall be adjusted to the correct position and orientation. The adjusted panel shall then be inspected for any geotextile damage or bentonite loss. Damage shall be repaired by the above procedure.

D. On gently sloping areas where seams may be placed across the slope, overlaps should be “shingled” so as to prevent flow into the seam.

3.07 DAMAGE REPAIR

A. Prior to cover material placement, damage to the GCL shall be identified and repaired by the INSTALLER. Damage is defined as cuts, rips or tears in the geotextiles, delamination of geotextiles, displaced panel or hydrated areas in the GCL.

B. Rips or tears on flat and sloped surfaces may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch cut from unused GCL over the damage (damaged material may be left in place), with a minimum overlap of 12 inches on all edges. Accessory bentonite shall then be placed between the patch edges and the repaired material at a rate of one-quarter pound per lineal foot of edge spread in a continuous six inch fillet, and the patch shall be placed over the area. An epoxy-based adhesive shall be used to keep the patch in position during backfill operations.

C. Displaced panels shall be adjusted to the correct position and orientation. The adjusted panel shall then be inspected for any geotextile damage or bentonite loss. Damage shall be repaired by the above procedure.

D. If the GCL is prematurely hydrated, the INSTALLER shall notify the QCA REPRESENTATIVE for a site specific determination as to whether the material is acceptable or if alternative measures must be taken to ensure the quality of the design.

E. Ensure that all defects and defect corrective actions (panel rejected, patch installed, etc.) are recorded, and corrective actions are performed in accordance with this specification.

3.08 DETAIL WORK
A. Detail Work, defined as the WORK necessary to seal the liner to pipe penetrations, foundation walls, drainage structures, and other appurtenances, shall be performed as recommended by the GCL MANUFACTURER. Recommended installation details shall be provided in the Installation Plan.

3.09 PLACEMENT OF OVERLYING MATERIALS

A. During placement of geomembrane upon the GCL, precautions shall be taken to prevent damaging the GCL by restricting heavy equipment traffic. Unrolling the geomembrane can be accomplished through the use of lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV). No vehicles larger than a ATV are allowed in direct contact with the GCL. This vehicle can be driven directly on the GCL, provided the ATV makes no sudden stops, starts, or turns.

B. Geomembrane to be installed over GCL shall be installed in accordance with installation requirements in Section 10107 High Density Polyethylene (HDPE) Geomembrane Liner.

END OF SECTION
SECTION 02778

HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER
(SECONDARY)

PART 1 - GENERAL

1.01 DESCRIPTION

A. The WORK described in this section consists of furnishing all labor, transportation, materials, supervision, administration, management, quality control and installation equipment necessary for the manufacturing, storage, delivery, watertight installation and testing of the 60 mil textured HDPE geomembrane for the liner system as herein specified and as shown on the drawings.

B. All materials shall conform to the following requirements and shall be of new stock of the highest grade available, free from defects, and recently manufactured.

C. All installation shall be in conformance with the MANUFACTURER’S recommendations and with current industry standards.

1.02 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) shall be performed by the geomembrane INSTALLER. The INSTALLER’s responsibilities shall include, but are not limited to the following:

   1. Supervise all geomembrane installation activities.

   2. Perform and document CQC testing as specified herein.

   3. Certify geomembrane materials and installation as meeting requirements of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by a designated CQA CONSULTANT and QA TESTING LABORATORY retained by the OWNER.

C. The CQA CONSULTANT or OWNER’S REPRESENTATIVE shall obtain samples and perform conformance testing of the geomembrane as indicated in Section 2.02 of this Section.

D. The CQA CONSULTANT, or his CQA REPRESENTATIVE, shall observe and monitor the geomembrane installation activities and obtain and perform CQA testing at random frequencies and locations.

E. The CQA CONSULTANT shall submit a final report, signed and sealed by a professional engineer licensed in the State of Florida, certifying the test results.
F. Based upon review of the CQC and CQA final reports, the CQA CONSULTANT will provide certification to the regulatory agencies that the geomembrane was installed in accordance with the Contract Documents.

G. The CONTRACTOR shall schedule WORK to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the geomembrane and shall keep the CQA CONSULTANT'S QA TESTING LABORATORY informed of the construction progress to provide sufficient time for laboratory testing.

1.03 DEFINITIONS

A. Lot - A quantity of resin (usually the capacity of one rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.

B. Construction Quality Assurance Consultant (CQA CONSULTANT) - Party, independent from the MANUFACTURER and INSTALLER that is responsible for observing and documenting activities related to quality assurance during the lining system construction.

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

D. Geomembrane Manufacturer (MANUFACTURER) - The party responsible for manufacturing the geomembrane rolls.

E. Geosynthetic Quality Assurance Laboratory (QA TESTING LABORATORY) - Party, independent from the OWNER, MANUFACTURER and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained during manufacturing, usually under the direction of the OWNER and CQA CONSULTANT.

F. INSTALLER - Party responsible for field handling, storing, deploying, seaming and testing of the geomembrane seams.

G. Panel - Unit area of a geomembrane that will be seamed in the field that is larger than 100 \( \text{ft}^2 \).

H. Patch - Unit area of a geomembrane that will be seamed in the field that is less than 100 \( \text{ft}^2 \).

1.04 QUALIFICATIONS

A. For general information purposes only, Geomembrane MANUFACTURER'S are the following or an ENGINEER approved equal:

1. Agru/America, Inc.

2. GSE Lining Technology, Inc.

3. Poly-Flex, Inc.
B. Manufacturer Qualifications: Manufacturer shall be a company, corporation, or firm regularly engaged in the development and manufacture of geosynthetic liners with a history of successful production/installation for a minimum period of 3 years. The geomembrane rolls shall be manufactured by a single MANUFACTURER. A company other than manufacturer may supply the geomembrane, however, the MANUFACTURER of the geomembrane shall be required to submit and meet the requirements stated in the Section. The MANUFACTURER shall submit written information on the following:

1. Information on plant size (square feet of geomembrane produced daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control program manual of descriptive documentation for production. The manual shall define sampling procedures, test frequencies and methods. The MANUFACTURER shall, at a minimum, comply with the Quality Control Specifications for this WORK.

4. A statement from the MANUFACTURER stating the Manufacturing Quality Control measures specified for this WORK will be followed and the manufactured geomembrane products will meet or exceed the product Specifications for this WORK.

5. Verification that the MANUFACTURER has successfully supplied geomembrane for a minimum of 6 projects in the United States, during the last 5 years, of similar size and scope totaling to a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Manufacturer had total manufacturing responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Manufacturer shall submit written information as follows:
   a. Name and location of project and date of installation.
   b. Contact name and phone number for each project.
   c. Geomembrane thickness and surface area of geomembrane installed.

C. Fabricator Qualifications: Qualified Fabricator shall be a company, corporation, or firm regularly engaged in the seaming and fabrication of geomembrane products, under factory-controlled conditions, for the installation of geomembrane under field conditions. The Fabricator usually seams together combinations of smaller rolls of geomembrane into larger factory panels for deployment in the field. The geomembrane shall be fabricated by a single Fabricator. The Fabricator shall submit written information on the following:
1. Information on plant size (square feet of geomembrane fabricated daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control procedures (manual) for fabrication. The manual shall define sampling procedures, test frequencies and methods. The Fabricator shall, at a minimum, comply with the quality control specification for this WORK.

4. A statement from the Fabricator stating the fabrication quality control measures specified for this WORK will be followed and the fabricated geomembrane products will meet or exceed the product specifications for this WORK.

5. The Fabricator shall have successfully fabricated geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Fabricator had total fabrication responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Fabricator shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area geomembrane installed.

D. INSTALLER QUALIFICATIONS: A qualified INSTALLER shall be a company, corporation, or a single INSTALLER. The INSTALLER shall submit written information on the following:

1. INSTALLER shall have installed a minimum of 10,000,000 square feet of HDPE geomembrane during the last 5 years or otherwise demonstrate they are qualified to perform the WORK.

2. INSTALLER shall have worked in a similar capacity on at least 6 projects similar in complexity to the project described in the Contract Documents.

3. The INSTALLER shall provide a minimum of one Field Installation Supervisor for WORK on the project.

   a. The Field Installation Supervisor qualifications to be assigned to this WORK shall have directly supervised the installation of a minimum of 2,000,000 square feet of geomembrane. No geomembrane shall be installed without the presence of the Field Installation Supervisor.
4. The INSTALLER shall provide a minimum of one Master Seamer for work on the project.
   
   a. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 linear feet of geomembrane seams using the same type of seaming apparatus to be used for this WORK. No seaming shall be carried out without the presence of the master seamer within the immediate vicinity.

5. Installation quality control testing personnel in the field shall have a minimum of 400,000 square feet of geomembrane quality control testing. Only the actual square footage that the personnel have directly performed quality control testing on shall be counted as fulfillment of the minimum square footage.

6. Quality Assurance/Quality Control Field Program - The INSTALLER shall, at a minimum, comply with the Specifications for this WORK. The QA/QC Field Program shall provide for recording all inspection and testing of all WORK items to ensure conformance to the applicable Contract Documents and Specifications with respect to materials, workmanship, construction, functional performance and identification. If differences exist between the INSTALLER’S Quality Control procedures and the Quality Control procedures specified by the ENGINEER or CQA CONSULTANT the procedures specified for the WORK shall govern installation. The QA/QC Field Program shall be subject to approval by the ENGINEER and include:
   
   a. Storage and Handling (equipment).
   b. Panel Identification.
   c. Panel Inspection.
   d. Panel Layout Drawings/Shop Drawings.
   e. Seam Identification.
   f. Seaming Process and Equipment.
   g. Seaming Inspection.
   h. Non-Destructive Tests (Seams, Repairs, Geomembrane Boots).
   i. Destructive Tests.
   j. Laboratory Tests.
l. Corrective Actions (i.e., addition of geomembrane, reduction of geomembrane, topography changes).

m. Procedures for Development of Record Drawings.

n. Weather Contingencies.

b. Record Keeping.

7. A statement from the INSTALLER stating the installation Quality Control measures specified for this WORK will be followed and the installed geomembrane products will meet or exceed the product Specifications for this WORK.

1.05 SUBMITTALS

A. The CONTRACTOR shall submit in writing to the ENGINEER, for approval, prior to delivery of the geomembrane to the site and prior to installation of the geomembrane material documentation on the following:

1. MANUFACTURER’S Qualification.

2. Fabricator’s Qualification (If a Fabricator is used).

3. INSTALLER’S Qualification.


5. Geomembrane Resin information and MANUFACTURER Quality Control Certificates.

6. Geomembrane MANUFACTURER material properties sheet, including at a minimum all properties specified in GRI GM13, including test methods used and Quality Control Certificates.

7. Fabricator’s Quality Control Certificates & Material Certification (if used).

8. Geomembrane Accessories.


10. Recommended loading, unloading, and handling equipment (include model number or load capacity).

11. A list indicating correlation between the MANUFACTURER Quality Control Certificates and individual geomembrane rolls.

12. The date of shipment of geomembrane from the MANUFACTURER. A minimum of 14 days shall be given to the ENGINEER so as to provide
sufficient time to perform conformance sampling and receive laboratory test results prior to shipment.

13. Direct Shear Test (Interface Shear Resistance): Direct Shear Test Results tests demonstrating compliance with Part 2.01.D.

14. Direct Shear Test Results (interface): Direct Shear Test Results tests demonstrating compliance with Part 2.02.E.

B. Installation Plan: The INSTALLER shall furnish the following information to the ENGINEER and OWNER prior to installation:

1. Installation layout drawing drawn to scale.
   a. Must show proposed geomembrane panel layout including field seams and details, panel location, orientation, identification, and installed square footage of geomembrane.
   b. Must be approved prior to installing the geomembrane.
      1) Approved drawings will be for concept only and actual panel placement will be determined by site conditions.

2. INSTALLER’S Geosynthetic Field Installation Quality Assurance Plan.

3. Description of welding equipment, techniques, and materials.

4. Complete set of forms used to record installation QA/QC data.

5. Resumes of key geomembrane installation personnel. (The Field Installation Supervisor, Master Seamer, and quality control personnel shall be clearly identified).


7. Warranty (Workmanship).

C. Resin - MANUFACTURER Quality Control Certificate, written on the MANUFACTURER’S company letterhead, shall be provided for the raw resin material used to produce each roll of geomembrane. The frequency of the testing of the resin batches shall be per MANUFACTURER’S Quality Control Plan but shall not be less than 1 test per resin lot. A resin lot is defined as 180,000 pounds or less of raw resin material. Resin shall meet the following minimum requirements:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (g/cm³)</td>
<td>ASTM D1505/D792</td>
<td>0.932 to 0.950</td>
</tr>
<tr>
<td>Melt Flow Index (g/10 min.)</td>
<td>ASTM D1238</td>
<td>≤ 1.0</td>
</tr>
<tr>
<td>Oxidation Induction Time (min)</td>
<td>ASTM D 3895</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>
D. Any geomembrane manufactured from resin not meeting the WORK Specifications shall be rejected and shall not be delivered to the project.

E. Sheet - MANUFACTURER Quality Control Certificate, written on the MANUFACTURER’S company letterhead, shall be provided for each roll of geomembrane, including roll identification number, and the results (listed individually) of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. At a minimum, the following tests shall be performed at a frequency of one test per 50,000 square feet of material per lot. Testing procedures and results shall conform to Table 2 of this Section.

1. Statement certifying no recycled polymer and no more than 10% rework of the same type of material is added to the resin (product run may be recycled).

**TABLE 2. HDPE LINER MANUFACTURING QUALITY CONTROL TESTING**

<table>
<thead>
<tr>
<th>TEST</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>ASTM D1505</td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D5994</td>
</tr>
<tr>
<td>Tensile Property (each direction)</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Yield Stress</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Yield Elongation</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Break Stress</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Break Elongation</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM D4218</td>
</tr>
<tr>
<td>Carbon Black Dispersion(^1)</td>
<td>ASTM D5596</td>
</tr>
</tbody>
</table>

Note 1 - Carbon black dispersion for 10 different views: all 10 in categories 1, 2.

F. The INSTALLER will submit the following to the ENGINEER upon completion of geomembrane installation:

1. Certificate stating the geomembrane has been installed in accordance with the Contract Documents.

2. Daily log including the daily record that summarizes panels deployed, seams completed, seam testing, seam repair, personnel on site, weather conditions, and equipment on site.

3. Panel Log: provides geomembrane roll number used and subgrade acceptance for each panel deployed.

4. Seam Testing Log: a complete record of all non-destructive and destructive testing performed as part of the INSTALLER’s QC program.

5. Seam/Repair Log: provides a complete record of all repairs and vacuum box testing of repairs made to defective seams and panels.

7. Record Drawings: The CONTRACTOR shall submit a panel layout drawing reflecting as-built conditions and related installation details (i.e., panel layout, penetrations, boots, connections, seam type) of the actual geomembrane lining system. The panel layout record drawings shall:

   a. Be at the same scale as the Contract Drawings, and use applicable drafting standards including a border identifying the INSTALLER, OWNER, project name and drawing name.

   b. Indicate the installed field panel and seam numbering, configuration and dimensions, geomembrane penetrations, and berms. The CQC CONSULTANT shall correlate the identification numbers for each roll of material to the installation field panel.

   c. Include the installed area, in square feet, of installed geomembrane.

   d. Include the locations of destructive samples and repairs with the correct corresponding sample number.

G. Prior to geomembrane installation, the CONTRACTOR shall supply the ENGINEER with signed and sealed survey drawings with data that clearly indicates the grades and elevation meet the Contract Documents and Specifications.

H. Upon completion of the subbase construction, prior to deploying the geomembrane, a “Certificate of Subbase Acceptance” shall be co-signed by the CONTRACTOR along with the INSTALLER prior to the installation of the 60 mil HDPE geomembrane certifying the Subbase was constructed in accordance with the approved Contract Documents and Specifications.

I. If the INSTALLER proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained shall be submitted to the ENGINEER for review and approval. Alternate seaming operations will not be allowed without prior approval from the ENGINEER.

1.06 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

A. Labeling - Each roll of geomembrane delivered to the site shall be labeled by the MANUFACTURER. The label will identify:

1. MANUFACTURER’S name

2. Product identification

3. Thickness
4. Length

5. Width

6. Roll number

B. Delivery - Rolls of liner will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.

C. Storage - Storage requirements for the materials shall be specified by the MANUFACTURER and INSTALLER. At a minimum, the storage location for geomembrane material, provided by the OWNER to protect the geomembrane from punctures, abrasions and excessive dirt and moisture, shall have the following characteristics:

1. Rolls shall be fully supported on pallets or other devices to be prevented from contacting the ground.

2. Water shall be prevented from accumulating beneath the rolls.

3. Geomembrane rolls shall not be stacked upon one another to the extent that deformation of the core or flattening of the rolls occurs.

4. Outdoor storage should not be allowed to exceed six months.

5. Protected from theft and vandalism.

6. Adjacent to the area being lined.

D. Handling - Each roll of geomembrane delivered to the site shall be inspected by the CONTRACTOR, at a minimum, as follows:

1. The CONTRACTOR shall provide transportation, labor, and handling for delivery of the geomembrane to and from the project site. Special transportation or handling requirements required for the geomembrane shall be provided by the CONTRACTOR.

2. The equipment for transportation, handling, loading and unloading the geomembrane shall be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage or personnel injury occurring. The type, size and capacity shall be according to the MANUFACTURER and INSTALLER requirements.

3. The CONTRACTOR shall provide all equipment and labor necessary for the loading, unloading, handling, and installation of the geomembrane.

4. Upon delivery to the project site, the geomembrane material shall be inspected by the CONTRACTOR to confirm that proper labeling,
transportation, handling, and storage procedures are followed. Damaged materials will be identified and repaired or rejected at the discretion of the ENGINEER. Materials to be repaired as specified herein. Repairs will be at no additional cost to the OWNER. Rejected materials will be identified and removed from the project site at no additional cost to the OWNER.

5. Each roll shall be delivered to the site bearing markings which provide the roll number, thickness of the material, length and width of the material, and the proper direction to unroll the material to facilitate layout and positioning in the field.

6. The materials shall be unloaded by the CONTRACTOR in areas designated by the OWNER. If the OWNER has not specified a storage area, the CONTRACTOR shall determine an area for storage of the materials to meet the WORK schedule requirements. In any case the materials shall not be stored or unloaded in areas that will impair the operations of the landfill facility or be deleterious to the materials.

7. Protection shall be provided, at a minimum, from puncture, cutting, ultraviolet radiation, precipitation, dirt or other damaging or deleterious conditions.

1.07 MATERIAL AND INSTALLATION WARRANTY

A. Material shall be warranted, on a pro-rata basis against MANUFACTURER’s defects for a period of 5 years from the date of final acceptance. The warranty shall state that materials will be repaired or replaced, by the MANUFACTURER, any defective materials or products that fail to meet the design requirements. Repair or replacement of such defective material and/or products shall be completed within 30 calendar days of notification by the Owner.

B. Installation shall be warranted against defects in workmanship for a period of 2 years from the date of final acceptance. The warranty shall state the installer will repair or replace any defective work that fails to meet the design requirements. Repair or replacement of such defective work shall be completed within 30 calendar days of notification by the Owner.

C. Warranty conditions proposed by the MANUFACTURER / FABRICATOR / INSTALLER concerning limits of liability will be submitted by the CONTRACTOR and will be evaluated upon receipt and must be acceptable to the OWNER prior to installation of the geomembrane.

PART 2 - PRODUCTS

2.01 GEOMEMBRANE

A. Material shall be 60 mil textured HDPE geomembrane textured on both sides as shown on the Contract Drawings and specified herein.
B. Geomembrane Rolls:

1. Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.

2. Geomembrane shall be free of holes, blisters, undispersed raw materials, nicks and cuts on roll edges or any sign of contamination by foreign matter. If pinholes are located, identified and indicated during manufacturing, these pinholes may be corrected during installation in accordance with the MANUFACTURER’S recommendations.

3. Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating the information provided in Section 1.06.A.

4. The 60 mil textured HDPE geomembrane shall conform to the physical properties requirements, at a minimum, as shown in Table 02778-B or the most current GRI standard for this product. Values presented in Table 02778-B are based upon standard GRI GM13 established by the Geosynthetics Research Institute (GRI) for HDPE.

5. The geomembrane shall be packaged and shipped by the MANUFACTURER in a manner to protect the integrity of the geomembrane from damage.

C. Extrudate Rod or Bead

1. Extrudate material shall be made from same type resin as the geomembrane.

2. Additives shall be thoroughly dispersed.

3. Materials shall be free of contamination by moisture or foreign matter.

D. Direct Shear Test (Interface Shear Resistance) - The CONTRACTOR will perform one Direct Shear Test in accordance with ASTM D5321 on representative samples of the Tri-axial geocomposite and 60 mil HDPE geomembrane. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the Direct Shear Testing with the results submitted to the ENGINEER:

1. Testing to be conducted under fully saturated (water) conditions.

2. Three Normal Loads = 1,000, 8,000, and 16,000 psf.

3. Test Configuration: Tri-axial geocomposite clamped to top box textured geomembrane clamped to bottom box

4. Strain Rate = 0.040 in/min.

5. Continue testing to ensure a full 3 inches of displacement.
6. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.

7. A minimum PEAK value of 0 psf adhesion and 20.5º for the interface friction angle is required for this project (based upon the best fit line).

8. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

E. Direct Shear Test (Interface Shear Resistance) - The CONTRACTOR will perform one Direct Shear Test in accordance with ASTM D5321 on representative samples of the tri-planar geocomposite and 60 mil HDPE geomembrane. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the Direct Shear Testing with the results submitted to the ENGINEER:

1. Testing to be conducted under fully saturated (water) conditions.

2. Three Normal Loads = 1,000, 8,000, and 16,000 psf.

3. Test Configuration: tri-planar geocomposite clamped to top box textured geomembrane clamped to bottom box

4. Strain Rate = 0.040 in/min.

5. Continue testing to ensure a full 3 inches of displacement.

6. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.

7. A minimum PEAK value of 0 psf adhesion and 20.5º for the interface friction angle is required for this project (based upon the best fit line).

8. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

2.02 CQA CONFORMANCE TESTING

A. In-Plant Conformance Sample Testing Services - The OWNER’S REPRESENTATIVE and CQA CONSULTANT have qualified personnel to collect conformance samples directly at the following facilities:

- GSE Lining Company
- AGRU America
- Poly-Flex, Inc.

1. Conformance sample(s) of the geomembrane will be collected by the OWNER’S REPRESENTATIVE or CQA CONSULTANT prior to shipment to the site.
2. Conformance sample(s) of the geomembrane will be tested by the CQA CONSULTANT prior to shipment to the site.

3. The CONTRACTOR shall coordinate with the MANUFACTURER, CQA CONSULTANT, and OWNER to schedule the date of delivery of the geomembrane to the site.

4. The CONTRACTOR shall inform, in writing, the CQA CONSULTANT and ENGINEER 14 days prior to the actual date of shipment from the MANUFACTURER. Geomembrane shall not be shipped prior to testing without OWNER’S approval.

5. Geomembrane products shipped to the site without prior sampling and approved conformance test results shall be sampled and tested upon delivery to the project site by the CQA CONSULTANT. All costs associated with collecting and shipping samples from the project site will be the CONTRACTOR’S responsibility. The CONTRACTOR shall allow a minimum of 7 days for sampling and testing approval of geomembrane materials upon delivery to the project site prior to installation.

6. Once sampled at the MANUFACTURER’S plant geomembrane products shall not be added or removed from the shipment. Upon addition or removal of products the following conditions shall prevail:
   a. Geomembrane products added shall be sampled for conformance testing at the CONTRACTOR’S expense.
   b. Individual geomembrane products removed from the shipment, which have been previously sampled or tested - Additional samples that have identical lot or batch numbers shall be sampled for conformance testing at the CONTRACTOR’S expense.

B. Conformance Sample Test Frequency (CQA) - The geomembrane shall be randomly sampled and tested by the OWNER’S REPRESENTATIVE or CQA CONSULTANT at a minimum of one sample per lot but at a rate of not less than one sample every 100,000 square feet of installed material from consecutively numbered rolls, whichever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the OWNER’S expense.

C. The initial conformance tests shall include the following:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>ASTM D5994</td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM D4218</td>
</tr>
<tr>
<td>Carbon Black Dispersion</td>
<td>ASTM D5596</td>
</tr>
<tr>
<td>Density</td>
<td>ASTM D1505 or ASTM D792</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>TEST METHOD</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Tensile Properties (each direction)</td>
<td>ASTM D6693 Type IV</td>
</tr>
<tr>
<td>Geomembrane/GCL Interface Friction Angle</td>
<td>ASTM D5321</td>
</tr>
<tr>
<td>Geomembrane/tri-planar Interface Interface Friction Angle</td>
<td>ASTM D5321</td>
</tr>
<tr>
<td>Geomembrane/Tri-axial Interface Friction Angle</td>
<td>ASTM D5321</td>
</tr>
</tbody>
</table>

Note: Required test results shall be in conformance with Table 2778-B.

D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The averaged test results of the geomembrane samples shall meet or exceed the Contract Documents and Specifications.

E. Samples that do not satisfy the Contract Documents and Specifications shall be cause to reject applicable rolls. If a geomembrane sample fails to meet Contract Documents and Specifications, subsequent tests shall be performed at random on additional geomembrane samples produced from the same resin batch to determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. This additional testing, at no additional cost to the COUNTY, may be performed to more closely identify the rolls which do not comply with the specifications. Rejected rolls will not be installed and shall be removed from the project site at no additional cost to the OWNER.

F. The CQA CONSULTANT will conduct one test on the actual extrudate welding rod used in the field for seaming and repairing the geomembrane panels to verify the material is compatible with the geomembrane. The tests shall consist of the following:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>(ASTM D792 Method A or ASTM D1505)</td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM D4218</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.01 GEOMEMBRANE SUBBASE

A. Surface to be lined shall be smooth and tested in accordance with Section 02220 Excavating, Backfilling and Compaction for Subbase Material. The area shall be free of all rocks (greater than ½-inch in any dimension), sticks (greater than ½-inch in diameter), roots, grass, refuse, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the geomembrane with no sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

B. All areas that have been subject to erosion shall be repaired as required in Section 02220 Excavating, Backfilling and Compaction. The repaired surface for geomembrane placement shall be even with no abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.
3.02 EQUIPMENT

A. Welding equipment and accessories shall, at a minimum, meet the following requirements:

1. Gauges showing temperatures in apparatus (extrusion welder) or wedge (wedge welder) shall be present.

2. An adequate number of welding apparati shall be available to avoid delaying WORK.

B. Power source must be capable of providing constant voltage under combined line load.

3.03 DEPLOYMENT

A. All activities by personnel and equipment in the vicinity of the geomembrane during and after geomembrane placement shall be monitored by the CONTRACTOR to insure that the geomembrane and geomembrane foundation are not damaged.

B. Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.

C. Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas. Field panels shall not be placed if any of the following conditions exists: inadequate geomembrane foundation, precipitation, presence of excessive moisture (i.e. fog, dew), ponded water, or presence of excessive winds.

D. Prior to welding, deploy panels in a “shingle” manner, wherein the upgradient panel overlays the downgradient panel.

E. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:

1. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage (spreader bar, protected equipment bucket).

2. Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift. The CONTRACTOR shall have sufficient sand bags or other appropriate anchoring materials on site to secure the geomembrane. CONTRACTOR shall replace or repair all geomembrane damaged (as determined by the ENGINEER) by wind or insufficient anchoring at no additional cost to the OWNER.

3. Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage it. Smoking will not be permitted on the geomembrane.
4. Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV’s and trucks are acceptable if wheel contact is less than 6 psi.

5. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.

F. Sufficient material (slack) shall be provided to allow for thermal expansion and contraction of the material. The geomembrane shall be installed so as to conform to the contours and grade breaks. The geomembrane shall remain in contact with the underlying soils. Sand bags or excess material, placed during deployment, shall be used to prevent bridging due to temperature or installation procedures. Allowances for additional material due to temperature and installation procedures shall be included in the bid and at no additional cost to the OWNER.

G. “Fishmouths” or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

H. If the INSTALLER proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained shall be submitted to the ENGINEER for review and approval 72 hours in advance. Alternate seaming operations will not be allowed without prior approval from the ENGINEER. If during the course of the WORK, the ENGINEER, CQA CONSULTANT, or OWNER decides the WORK is inadequate, the CONTRACTOR shall adjust operations as required or WORK shall ceased. Contract Documents and Specifications for placing and seaming the geomembrane shall apply to all WORK conditions.

3.04 FIELD SEAMING

A. Seams shall meet the following requirements:

1. To the maximum extent possible, orient seams parallel to line of slope, i.e., down and not across slope.

2. Minimize number of field seams in corners, odd-shaped geometric locations and outside corners.

3. Slope seams (panels) shall extend a minimum of five-feet beyond the grade break into the flat area.

4. Use a sequential seam numbering system compatible with panel numbering system that is agreeable to the CQA CONSULTANT and INSTALLER.

5. Align seam overlaps consistent with the requirements of the welding equipment being used. The panels of geomembrane have a finished
overlap of 4 inches for extrusion welding and 6 inches for fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam.

B. During welding operations provide at least one Master Seamer who shall provide direct supervision over other welders as necessary.

C. Extrusion Welding
   1. Hot-air tack adjacent pieces together using procedures that do not damage the geomembrane.
   2. Clean geomembrane surfaces by disc grinder or equivalent.

D. Hot Wedge Welding
   1. Welding apparatus shall be a self-propelled device equipped with an electronic controller which displays applicable temperatures.
   2. Clean seam area of dust, mud, moisture and debris immediately ahead of hot wedge welder.
   3. Protect against moisture build-up between sheets.

E. Trial Welds
   1. Perform trial welds on geomembrane samples to verify welding equipment is operating properly.
   2. Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.
   3. Minimum of two trial welds per day, per welding apparatus, one made prior to the start of work and one completed at mid shift. (typically after lunch break). Additionally, perform trial welds at any time the welding equipment is shut down and restarted.
   4. Cut four, one inch wide by 6 inch long test strips from the trial weld.
   5. Quantitatively test specimens for peel adhesion and then for shear strength.
   6. Trial weld specimens shall pass when the minimum results, as indicated in Table 02778-A, are achieved in both peel and shear tests.
      a. The break, when peel testing, occurs in the liner material itself, not through peel separation (FTB).
b. The break is ductile.

7. Repeat the trial weld, in its entirety, when any of the trial weld samples fail in either peel or shear.

8. No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.

F. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. Immediately prior to seaming procedures, the seam area shall be completely free of moisture, dirt, or foreign material of any kind. INSTALLER shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.

G. Defects and Repairs

1. Examine all seams and non-seam areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.

2. Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations that have been repaired until test results with passing values are available.

H. Cold weather installations should follow the guidelines contained in GRI GM9.

3.05 FIELD QUALITY ASSURANCE

A. MANUFACTURER and INSTALLER shall participate in and conform to all terms and requirements of the OWNER’S CQA Plan. CONTRACTOR shall be responsible for assuring this participation.

B. Welding equipment shall be calibrated prior to each day’s welding in accordance with the Installation Plan. The INSTALLER shall record all calibration data for inclusion in the final report. Additional test welds shall be performed for each welding machine every 4 hours, if welder is turned off, prior to starting work, after lunch, or as directed by the CQA CONSULTANT.

3.06 NON-DESTRUCTIVE TESTING

A. Non-destructive testing shall be carried out as the seaming progresses. All seams shall be non-destructively tested in the presence of the CQA CONSULTANT. Insufficient seams shall be labeled, recorded, repaired and re-tested.

1. Vacuum Box Testing - Shall be performed in accordance with ASTM D5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.

   a. Shall be required for all extrusion welds, except for those welds inaccessible to the vacuum box, such as geomembrane boots. Air
pressure gauges shall read 0 psi when testing apparatus is not
turned on. Pressure gauges not reading 0 psi shall be replaced.
Vacuum box apparatus shall be capable of sustaining a vacuum
pressure 5 psi (gauge) for 10 seconds while placed on a seam. The
following procedures shall be followed:

1) Energize the vacuum pump and reduce the tank pressure to
approximately 10 inches of mercury, i.e., 5 psi gauge. All
gauges shall read 0 psi when the vacuum pump is not
turned on. Gauges not reading 0 psi shall be replaced.

2) Wet a strip of geomembrane approximately 4 inches by 24
inches with a soapy solution.

3) Place the box over the wetted soapy area.

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

5) Ensure that a leak tight seal is created.

6) For a period of not less than 10 seconds, examine the
geomembrane through the viewing window for the
presence of soap bubbles, which would indicate defects in
the geomembrane.

7) If no bubble appears after 10 seconds, close the vacuum
valve and open the bleed valve, move the box over the next
adjoining area with a minimum 3 inches overlap, and
repeat the process.

8) All areas where soap bubbles appear shall be marked and
repaired by extrusion weld or patching.

2. Air Pressure Testing - Shall be performed in accordance with ASTM
D5820, Standard Practice for Pressurized Air Channel Evaluation of Dual
Seamed Geomembranes.

a. Testing apparatus shall be capable of generating a minimum
pressure of 25 psi. Air pressure gauges shall read 0 psi when
testing apparatus is not turned on. Pressure gauges not reading 0
psi shall be replaced. The air channel shall be pressurized from 25
to 30 psi and allowed to stabilize. Once stabilized, the channel
pressure shall be sustained for a minimum of 5 minutes. If loss of
pressure is more than 2 psi, or the pressure does not stabilize, the
seam shall be rejected, the faulty area located and repaired and the
seam re-tested. The following procedures shall be followed:

1) Seal both ends of the seam to be tested.
2) Insert needle or other approved pressure feed device into the tunnel created by the fusion weld.

3) Insert a protective cushion between the air pump and the geomembrane.

4) Energize the air pump to a pressure between 25 and 30 psi, close valve, allow channel pressure to stabilize, and sustain channel pressure for approximately 5 minutes.

5) If loss of pressure is more than 2 psi or does not stabilize, locate faulty area and repair.

6) After a seam has passed a pressure test, release pressure at the end of the seam that is opposite the air pump and pressure gauge assembly to ensure that the seam is continuous and has been completely tested.

B. The CQA CONSULTANT shall include all results from the destructive and non-destructive seam tests into the final report.

3.07 DESTRUCTIVE TESTING

A. Performed by the CQA CONSULTANT with assistance from the INSTALLER.

B. Location and Frequency of Testing

1. Installed geomembrane shall be tested at a rate of one test per 500 linear feet of welded seam at locations selected by the CQA CONSULTANT.

2. Test locations will be determined after seaming.

C. Sampling procedures are performed as follows:

1. INSTALLER shall cut samples at locations designated by the CQA CONSULTANT as the seaming progresses in order to obtain field laboratory test results before the geomembrane is covered.

2. CQA CONSULTANT will number each sample and the location will be noted on the installation as-built.

3. The CQC CONSULTANT shall remove the sample with the seam centered lengthwise, approximately 12 inches wide across the seam by 42 inches long, and test a portion of the geomembrane seam in accordance with the CQA Plan. The location shall be recorded, repaired and tested. The repair of the destructive seam samples shall be at no additional cost to the OWNER. The CQC CONSULTANT shall distribute as follows:

a. A 12 inch by 14 inch portion to the CQA CONSULTANT for Third Party Laboratory Quality Assurance testing.
b. A 12 inch by 14 inch portion shall be retained by the INSTALLER for field testing.

c. A 12 inch by 14 inch portion to the OWNER for archive storage.

4. Testing performed on each sample shall include geomembrane peel adhesion and seam strength. Seam peel strength and shear strength shall meet the requirements specified in Table 02778-A.

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD/VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peel Strength</td>
<td>ASTM D 6392</td>
</tr>
<tr>
<td>Wedge Weld (lb/in width)</td>
<td>98</td>
</tr>
<tr>
<td>Extrusion Weld (lb/in width)</td>
<td>78</td>
</tr>
<tr>
<td>Shear Strength</td>
<td>ASTM D 6392</td>
</tr>
<tr>
<td>Wedge Weld (lb/in width)</td>
<td>120</td>
</tr>
<tr>
<td>Extrusion Weld (lb/in width)</td>
<td>120</td>
</tr>
</tbody>
</table>

5. Ten 1-inch wide strips shall be cut from the CQC CONSULTANT'S portion of the sample and these shall be tested in the field by the INSTALLER.

6. Field Testing - The ten 1-inch wide strips shall be tested by the CQC CONSULTANT in the field using a tensiometer, five for peel and five for shear, and shall meet the Specifications. If any field test sample fails to pass, then the procedures outlined in Section 3.07.C.(8) shall be followed.

7. Laboratory Testing - Testing by the CQA CONSULTANT will include Seam Strength and Peel Adhesion. A total of 5 specimens will be tested from each sample for each test method. All of the 5 specimens must pass the minimum pounds per inch value listed in Table 02778-A and -B and all specimens must separate by FTB failure for each test in order for the seam to pass destructive test sampling. The results will not be averaged. Specimens will be selected alternately, by test, from the samples (i.e., peel, shear, peel, shear). The CQA CONSULTANT will provide test results to the CONTRACTOR no more than 24 hours after the samples are received at the laboratory. The only exception shall be weekends or official holidays when the laboratories are closed. Arrangements to schedule testing of destructive samples on weekends and holidays shall be approved by the CQA CONSULTANT 24 hours in advance. Additional
costs for lab work on holidays or weekends shall be at no additional expense to the OWNER and shall be paid by the CONTRACTOR.

8. Procedures for Destructive Test Failure - The following procedures shall apply whenever a sample fails the destructive test, whether the test is conducted by the CQA CONSULTANT’S laboratory or by field tensiometer. The geomembrane INSTALLER shall have two options, the cost of which shall be at no additional expense to the OWNER:

a. The geomembrane INSTALLER can reconstruct the seam between any two passed test locations.

b. The geomembrane INSTALLER can trace the welding path to an intermediate location at 10 feet, minimum, from the location of the failed test in each direction, and take a specimen for an additional field test at each location. If these additional specimens pass the test, then full laboratory destructive samples shall be taken. These additional tests shall be at the expense of the CONTRACTOR. If these laboratory samples pass the test, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In any case, all acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet of reconstructed seam, a sample taken from within the reconstructed zone must pass destructive testing. Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and/or welding apparatus or welded during the same time shift. Such additional testing shall be at the CONTRACTOR’S expense.

3.08 REPAIR PROCEDURES

A. All seams and non-seam areas of the geomembrane shall be inspected by the INSTALLER and CQA CONSULTANT for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface shall be brushed, blown, or washed by the CONTRACTOR if the amount of dust, mud or debris inhibits inspection. The CQA CONSULTANT shall decide if cleaning of the geomembrane is needed to facilitate inspection. The INSTALLER shall be responsible for repair of defective areas at no additional expense to the OWNER.

B. Agreement upon the appropriate repair method shall be decided between CQA CONSULTANT and INSTALLER by using one of the following repair methods:

1. Patching - Patches shall be round or oval in shape made of the same geomembrane and extend a minimum of 6 inches beyond the edge of defects. All patches shall be of the same compound and thickness as the
All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only.

2. Abrading and Re-welding - Used to repair short section of a seam.

3. Spot Welding - Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.


5. Remove the unacceptable seam and replace with new material.

C. The following procedures shall be observed when a repair method is used:

1. All geomembrane surfaces shall be clean and dry at the time of repair.

2. Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.

3. Extend patches or caps at least 6 inches for extrusion welds and 4 inches for wedge welds beyond the edge of the defect, and around all corners of patch material.

D. Repair Verification

1. Each repair shall be non-destructively tested. In addition the CQA CONSULTANT may require a destructive seam sample be obtained from a repaired seam. Repairs that pass the non-destructive and/or destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

2. Number and log each patch repair (performed by CQA CONSULTANT).

3.09 ANCHOR TRENCH

A. The anchor trench shall be excavated prior to geomembrane installation. No loose soil, roots, rocks, or materials capable of damaging the geomembrane shall be allowed beneath the geomembrane. The anchor trench shall be backfilled and compacted as indicated on the Drawings, and in a manner that prevents any damage to the geomembrane. The geomembrane shall not have sharply folded corners when placed into the anchor trench. The geomembrane shall be welded the entire length of the panel, including through the entire dimension of the trench.

3.10 OVERLYING GEOMCOMPOSITE

A. During placement of the geocomposite upon the geomembrane, precautions shall be taken to prevent damage to the geomembrane by restricting heavy equipment traffic. Unrolling the geocomposite can be accomplished through the use of
lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV). This vehicle can be driven directly on the geomembrane, provided the ATV makes no sudden stops, starts, or turns.

B. Geomembrane which is covered prior to approval by the CQA CONSULTANT shall be uncovered at no additional cost to the OWNER.

C. The CONTRACTOR shall schedule his work so as to permit as much time as needed for testing and CQC/CQA documentation before placing the overlying soil layer(s).

D. The CONTRACTOR shall place the overlying geocomposite layer immediately upon approval of the geomembrane by the CQA CONSULTANT to prevent damage, uplift, or degradation of the geomembrane.

3.11 SURVEY CONTROL STAKES

A. Survey stakes in the vicinity of the geomembrane shall be placed with care as not to penetrate the geomembrane liner. Plastic traffic cones, cardboard tubes or other items as approved by the ENGINEER may be used as survey control devices.

3.12 FINAL ACCEPTANCE

A. The CONTRACTOR shall retain ownership and responsibility for the installed geomembrane until final acceptance by the OWNER.

B. Final acceptance of the geomembrane by the OWNER will occur when:

1. All installation activities are completed.

2. All documentation of installation is completed and the INSTALLER’S final report is submitted to and accepted by the ENGINEER.

3. All documents presented in Section 1.05 have been submitted to the ENGINEER and approved.
Table 02778-B

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
<th>60 mils</th>
<th>TEST FREQUENCY (minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness (min. avg.)</td>
<td>ASTM D5994</td>
<td>nom. (-5%)</td>
<td>per roll</td>
</tr>
<tr>
<td>• lowest individual for 8 out of 10 values</td>
<td>-10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• lowest individual for any of the 10 values</td>
<td>-15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asperity Height (min. avg.) (1)</td>
<td>ASTM D7466</td>
<td>16 mil</td>
<td>every 2nd roll (1) (2)</td>
</tr>
<tr>
<td>Density (min. avg.)</td>
<td>ASTM D1505/D792</td>
<td>0.940 g/cc</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>Tensile Properties (min. avg.) (3)</td>
<td>ASTM D6693 Type IV</td>
<td>126 lbs/in (min)</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>• Yield Strength</td>
<td>90 lbs/in (min)</td>
<td>1 per 50,000 ft²</td>
<td></td>
</tr>
<tr>
<td>• Break Strength</td>
<td>12% (each)</td>
<td>1 per 50,000 ft²</td>
<td></td>
</tr>
<tr>
<td>• Yield Elongation</td>
<td>100% (min)</td>
<td>1 per 50,000 ft²</td>
<td></td>
</tr>
<tr>
<td>• Break Elongation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tear Resistance (min. avg.)</td>
<td>ASTM D1004</td>
<td>42 lb</td>
<td>1 per 100,000 ft²</td>
</tr>
<tr>
<td>Puncture Resistance (min. avg.)</td>
<td>ASTM D4833</td>
<td>90 lb</td>
<td>1 per 100,000 ft²</td>
</tr>
<tr>
<td>Stress Crack Resistance (4)</td>
<td>ASTM D5397</td>
<td>500 hour min.</td>
<td>per GRI GM10</td>
</tr>
<tr>
<td>Carbon Black Content (range)</td>
<td>ASTM D4218 (5)</td>
<td>2.0 - 3.0%</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>Carbon Black Dispersion</td>
<td>ASTM D5596</td>
<td>Note (6)</td>
<td>1 per 100,000 ft²</td>
</tr>
<tr>
<td>Oxidative Induction Time (OIT) (min. avg.) (7)</td>
<td>ASTM D3895</td>
<td>100 minutes min.</td>
<td>per resin lot</td>
</tr>
<tr>
<td>(a) Standard OIT</td>
<td>ASTM D5885</td>
<td>400 minutes min.</td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oven Aging at 85°C (7), (8)</td>
<td>ASTM D5721</td>
<td>55%</td>
<td>per each formulation</td>
</tr>
<tr>
<td>(a) Standard OIT (min. avg.) - % retained after 90 days</td>
<td>ASTM D3895</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT (min avg.) - % retained after 90 days</td>
<td>ASTM D5885</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UV Resistance (9)</td>
<td>GM11</td>
<td>N.R.</td>
<td>per each formulation</td>
</tr>
<tr>
<td>(a) Standard OIT (min. avg.)</td>
<td>ASTM D3895</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT (min. avg.) - % retained after 1600 hrs</td>
<td>ASTM D5885</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

(1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be 5> mils; also see Note 6.
(2) Alternate the measurement side for double sided textured sheet.
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
(4) Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches
P-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer’s mean value via MQC testing.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer’s mean value via MQC testing.
(5) Other methods such as ASTM D1603 (tube furnace) or ASTM D6370 (TGA) are acceptable if an appropriate correlation to ASTM D4218 (muffle furnace) can be established.
(6) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
all in Categories 1 or 2.
(7) The manufacturer has the option to select one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(8) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(9) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(10) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(11) UV resistance is based on percent retained value regardless of the original HP-OIT value.
<table>
<thead>
<tr>
<th>Company name</th>
<th>Years of geomembrane installation experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square feet installed</td>
<td></td>
</tr>
<tr>
<td>Raw material used</td>
<td></td>
</tr>
<tr>
<td>Sheet width manufactured (ft.)</td>
<td></td>
</tr>
<tr>
<td>Sheet width delivered (ft.)</td>
<td></td>
</tr>
<tr>
<td>Field Supervisor years of experience</td>
<td></td>
</tr>
<tr>
<td>Square feet of geomembrane supervised</td>
<td></td>
</tr>
<tr>
<td>Delivery time after approved layout drawings</td>
<td>weeks</td>
</tr>
<tr>
<td>Detailed company experience information attached</td>
<td>yes</td>
</tr>
</tbody>
</table>
SECTION 02779

CONDUCTIVE HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER (PRIMARY)

PART 1 - GENERAL

1.01 DESCRIPTION

A. The WORK described in this section consists of furnishing all labor, transportation, materials, supervision, administration, management, quality control and installation equipment necessary for the manufacturing, storage, delivery, watertight installation and testing of the 60 mil textured HDPE geomembrane for the liner system as herein specified and as shown on the drawings.

B. All materials shall conform to the following requirements and shall be of new stock of the highest grade available, free from defects, and recently manufactured.

C. All installation shall be in conformance with the MANUFACTURER’S recommendations and with current industry standards.

1.02 CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) shall be performed by the geomembrane INSTALLER. The INSTALLER’s responsibilities shall include, but are not limited to the following:

1. Supervise all geomembrane installation activities.

2. Perform and document CQC testing as specified herein.

3. Certify geomembrane materials and installation as meeting requirements of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by a designated CQA CONSULTANT and QA TESTING LABORATORY retained by the OWNER.

C. The CQA CONSULTANT or OWNER’S REPRESENTATIVE shall obtain samples and perform conformance testing of the geomembrane as indicated in Section 2.02 of this Section.

D. The CQA CONSULTANT, or his CQA REPRESENTATIVE, shall observe and monitor the geomembrane installation activities and obtain and perform CQA testing at random frequencies and locations.

E. The CQA CONSULTANT shall submit a final report, signed and sealed by a professional engineer licensed in the State of Florida, certifying the test results.
F. Based upon review of the CQC and CQA final reports, the CQA CONSULTANT will provide certification to the regulatory agencies that the geomembrane was installed in accordance with the Contract Documents.

G. The CONTRACTOR shall schedule WORK to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the geomembrane and shall keep the CQA CONSULTANT'S QA TESTING LABORATORY informed of the construction progress to provide sufficient time for laboratory testing.

1.03 DEFINITIONS

A. Lot - A quantity of resin (usually the capacity of one rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.

B. Construction Quality Assurance Consultant (CQA CONSULTANT) - Party, independent from the MANUFACTURER and INSTALLER that is responsible for observing and documenting activities related to quality assurance during the lining system construction.

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

D. Geomembrane Manufacturer (MANUFACTURER) - The party responsible for manufacturing the geomembrane rolls.

E. Geosynthetic Quality Assurance Laboratory (QA TESTING LABORATORY) - Party, independent from the OWNER, MANUFACTURER and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained during manufacturing, usually under the direction of the OWNER and CQA CONSULTANT.

F. INSTALLER - Party responsible for field handling, storing, deploying, seaming and testing of the geomembrane seams.

G. Panel - Unit area of a geomembrane that will be seamed in the field that is larger than 100 ft².

H. Patch - Unit area of a geomembrane that will be seamed in the field that is less than 100 ft².

1.04 QUALIFICATIONS

A. For general information purposes only, Geomembrane MANUFACTURER is the following or an ENGINEER approved equal:

1. GSE Lining Technology, Inc.

B. Manufacturer Qualifications: Manufacturer shall be a company, corporation, or firm regularly engaged in the development and manufacture of geosynthetic liners
with a history of successful production/installation for a minimum period of 3 years. The geomembrane rolls shall be manufactured by a single MANUFACTURER. A company other than manufacturer may supply the geomembrane, however, the MANUFACTURER of the geomembrane shall be required to submit and meet the requirements stated in the Section. The MANUFACTURER shall submit written information on the following:

1. Information on plant size (square feet of geomembrane produced daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control program manual of descriptive documentation for production. The manual shall define sampling procedures, test frequencies and methods. The MANUFACTURER shall, at a minimum, comply with the Quality Control Specifications for this WORK.

4. A statement from the MANUFACTURER stating the Manufacturing Quality Control measures specified for this WORK will be followed and the manufactured geomembrane products will meet or exceed the product Specifications for this WORK.

5. Verification that the MANUFACTURER has successfully supplied geomembrane for a minimum of 6 projects in the United States, during the last 5 years, of similar size and scope totaling to a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Manufacturer had total manufacturing responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Manufacturer shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area of geomembrane installed.

C. Fabricator Qualifications: Qualified Fabricator shall be a company, corporation, or firm regularly engaged in the seaming and fabrication of geomembrane products, under factory-controlled conditions, for the installation of geomembrane under field conditions. The Fabricator usually seams together combinations of smaller rolls of geomembrane into larger factory panels for deployment in the field. The geomembrane shall be fabricated by a single Fabricator. The Fabricator shall submit written information on the following:

1. Information on plant size (square feet of geomembrane fabricated daily), number of shifts, and capacity of each shift.
2. Daily production quantity shall be sufficient to meet the demands of the
   schedule for this WORK.

3. Quality Control procedures (manual) for fabrication. The manual shall
   define sampling procedures, test frequencies and methods. The Fabricator
   shall, at a minimum, comply with the quality control specification for this
   WORK.

4. A statement from the Fabricator stating the fabrication quality control
   measures specified for this WORK will be followed and the fabricated
   geomembrane products will meet or exceed the product specifications for
   this WORK.

5. The Fabricator shall have successfully fabricated geomembrane products
   for at least 6 projects, during the last 5 years, of similar size and function
   totaling a minimum of 10 million square feet of installed geomembrane.
   Projects shall be considered similar only if the Fabricator had total
   fabrication responsibility for geomembrane production and the installed
   geomembrane has successfully fulfilled its primary function for a
   minimum of 2 years. The Fabricator shall submit written information as
   follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area geomembrane installed.

D. INSTALLER QUALIFICATIONS: A qualified INSTALLER shall be a company,
   corporation, or a single INSTALLER. The INSTALLER shall submit written
   information on the following:

1. INSTALLER shall have installed a minimum of 10,000,000 square feet of
   HDPE geomembrane during the last 5 years or otherwise demonstrate they
   are qualified to perform the WORK.

2. INSTALLER shall have worked in a similar capacity on at least 6 projects
   similar in complexity to the project described in the Contract Documents.

3. The INSTALLER shall provide a minimum of one Field Installation
   Supervisor for WORK on the project.

   a. The Field Installation Supervisor qualifications to be assigned to
      this WORK shall have directly supervised the installation of a
      minimum of 2,000,000 square feet of geomembrane. No
      geomembrane shall be installed without the presence of the Field
      Installation Supervisor.

4. The INSTALLER shall provide a minimum of one Master Seamer for
   work on the project.
a. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 linear feet of geomembrane seams using the same type of seaming apparatus to be used for this WORK. No seaming shall be carried out without the presence of the master seamer within the immediate vicinity.

5. Installation quality control testing personnel in the field shall have a minimum of 400,000 square feet of geomembrane quality control testing. Only the actual square footage that the personnel have directly performed quality control testing on shall be counted as fulfillment of the minimum square footage.

6. Quality Assurance/Quality Control Field Program - The INSTALLER shall, at a minimum, comply with the Specifications for this WORK. The QA/QC Field Program shall provide for recording all inspection and testing of all WORK items to ensure conformance to the applicable Contract Documents and Specifications with respect to materials, workmanship, construction, functional performance and identification. If differences exist between the INSTALLER’S Quality Control procedures and the Quality Control procedures specified by the ENGINEER or CQA CONSULTANT the procedures specified for the WORK shall govern installation. The QA/QC Field Program shall be subject to approval by the ENGINEER and include:

a. Storage and Handling (equipment).

b. Panel Identification.

c. Panel Inspection.

d. Panel Layout Drawings/Shop Drawings.

e. Seam Identification.

f. Seaming Process and Equipment.

g. Seaming Inspection.

h. Non-Destructive Tests (Seams, Repairs, Geomembrane Boots).

i. Destructive Tests.

j. Laboratory Tests.


l. Corrective Actions (i.e., addition of geomembrane, reduction of geomembrane, topography changes).
m. Procedures for Development of Record Drawings.

n. Weather Contingencies.

b. Record Keeping.

7. A statement from the INSTALLER stating the installation Quality Control measures specified for this WORK will be followed and the installed geomembrane products will meet or exceed the product Specifications for this WORK.

**1.05 SUBMITTALS**

A. The CONTRACTOR shall submit in writing to the ENGINEER, for approval, prior to delivery of the geomembrane to the site and prior to installation of the geomembrane material documentation on the following:

1. MANUFACTURER’S Qualification.

2. Fabricator’s Qualification (If a Fabricator is used).

3. INSTALLER’S Qualification.


5. Geomembrane Resin information and MANUFACTURER Quality Control Certificates.

6. Geomembrane MANUFACTURER material properties sheet, including at a minimum all properties specified in GRI GM13, including test methods used and Quality Control Certificates.

7. Fabricator’s Quality Control Certificates & Material Certification (if used).

8. Geomembrane Accessories.


10. Recommended loading, unloading, and handling equipment (include model number or load capacity).

11. A list indicating correlation between the MANUFACTURER Quality Control Certificates and individual geomembrane rolls.

12. The date of shipment of geomembrane from the MANUFACTURER. A minimum of 14 days shall be given to the ENGINEER so as to provide sufficient time to perform conformance sampling and receive laboratory test results prior to shipment.
13. Direct Shear Test (Interface Shear Resistance): Direct Shear Test Results tests demonstrating compliance with Part 2.01.D.

14. Direct Shear Test Results (interface): Direct Shear Test Results tests demonstrating compliance with Part 2.02.E.

B. Installation Plan: The INSTALLER shall furnish the following information to the ENGINEER and OWNER prior to installation:

1. Installation layout drawing drawn to scale.
   a. Must show proposed geomembrane panel layout including field seams and details, panel location, orientation, identification, and installed square footage of geomembrane.

   b. Must be approved prior to installing the geomembrane.

      1) Approved drawings will be for concept only and actual panel placement will be determined by site conditions.

2. INSTALLER’S Geosynthetic Field Installation Quality Assurance Plan.

3. Description of welding equipment, techniques, and materials.

4. Complete set of forms used to record installation QA/QC data.

5. Resumes of key geomembrane installation personnel. (The Field Installation Supervisor, Master Seamer, and quality control personnel shall be clearly identified).


7. Warranty (Workmanship).

C. Resin - MANUFACTURER Quality Control Certificate, written on the MANUFACTURER’S company letterhead, shall be provided for the raw resin material used to produce each roll of geomembrane. The frequency of the testing of the resin batches shall be per MANUFACTURER’S Quality Control Plan but shall not be less than 1 test per resin lot. A resin lot is defined as 180,000 pounds or less of raw resin material. Resin shall meet the following minimum requirements:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (g/cm³)</td>
<td>ASTM D1505/D792</td>
<td>0.932 to 0.950</td>
</tr>
<tr>
<td>Melt Flow Index (g/10 min.)</td>
<td>ASTM D1238</td>
<td>≤ 1.0</td>
</tr>
<tr>
<td>Oxidation Induction Time (min)</td>
<td>ASTM D 3895</td>
<td>&gt;100</td>
</tr>
</tbody>
</table>

D. Any geomembrane manufactured from resin not meeting the WORK Specifications shall be rejected and shall not be delivered to the project.
E. Sheet - MANUFACTURER Quality Control Certificate, written on the MANUFACTURER’S company letterhead, shall be provided for each roll of geomembrane, including roll identification number, and the results (listed individually) of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. At a minimum, the following tests shall be performed at a frequency of one test per 50,000 square feet of material per lot. Testing procedures and results shall conform to Table 2 of this Section.

1. Statement certifying no recycled polymer and no more than 10% rework of the same type of material is added to the resin (product run may be recycled).

<table>
<thead>
<tr>
<th>TEST</th>
<th>PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>ASTM D1505</td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D5994</td>
</tr>
<tr>
<td>Tensile Property (each direction)</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Yield Stress</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Yield Elongation</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Break Stress</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Break Elongation</td>
<td>ASTM D6693</td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM D4218</td>
</tr>
<tr>
<td>Carbon Black Dispersion¹</td>
<td>ASTM D5596</td>
</tr>
</tbody>
</table>

Note 1 - Carbon black dispersion for 10 different views: all 10 in categories 1, 2.

F. The INSTALLER will submit the following to the ENGINEER upon completion of geomembrane installation:

1. Certificate stating the geomembrane has been installed in accordance with the Contract Documents.

2. Daily log including the daily record that summarizes panels deployed, seams completed, seam testing, seam repair, personnel on site, weather conditions, and equipment on site.

3. Panel Log: provides geomembrane roll number used and subgrade acceptance for each panel deployed.

4. Seam Testing Log: a complete record of all non-destructive and destructive testing performed as part of the INSTALLER’s QC program.

5. Seam/Repair Log: provides a complete record of all repairs and vacuum box testing of repairs made to defective seams and panels.

7. Record Drawings: The CONTRACTOR shall submit a panel layout drawing reflecting as-built conditions and related installation details (i.e., panel layout, penetrations, boots, connections, seam type) of the actual geomembrane lining system. The panel layout record drawings shall:

a. Be at the same scale as the Contract Drawings, and use applicable drafting standards including a border identifying the INSTALLER, OWNER, project name and drawing name.

b. Indicate the installed field panel and seam numbering, configuration and dimensions, geomembrane penetrations, and berms. The CQC CONSULTANT shall correlate the identification numbers for each roll of material to the installation field panel.

c. Include the installed area, in square feet, of installed geomembrane.

d. Include the locations of destructive samples and repairs with the correct corresponding sample number.

G. Prior to geomembrane installation, the CONTRACTOR shall supply the ENGINEER with signed and sealed survey drawings with data that clearly indicates the grades and elevation meet the Contract Documents and Specifications.

H. Upon completion of the subbase construction, prior to deploying the geomembrane, a “Certificate of Subbase Acceptance” shall be co-signed by the CONTRACTOR along with the INSTALLER prior to the installation of the 60 mil HDPE geomembrane certifying the Subbase was constructed in accordance with the approved Contract Documents and Specifications.

I. If the INSTALLER proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained shall be submitted to the ENGINEER for review and approval. Alternate seaming operations will not be allowed without prior approval from the ENGINEER.

1.06 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

A. Labeling - Each roll of geomembrane delivered to the site shall be labeled by the MANUFACTURER. The label will identify:

1. MANUFACTURER’S name

2. Product identification

3. Thickness

4. Length
5. Width

6. Roll number

B. Delivery - Rolls of liner will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.

C. Storage - Storage requirements for the materials shall be specified by the MANUFACTURER and INSTALLER. At a minimum, the storage location for geomembrane material, provided by the OWNER to protect the geomembrane from punctures, abrasions and excessive dirt and moisture, shall have the following characteristics:

1. Rolls shall be fully supported on pallets or other devices to be prevented from contacting the ground.

2. Water shall be prevented from accumulating beneath the rolls.

3. Geomembrane rolls shall not be stacked upon one another to the extent that deformation of the core or flattening of the rolls occurs.

4. Outdoor storage should not be allowed to exceed six months.

5. Protected from theft and vandalism.

6. Adjacent to the area being lined.

D. Handling - Each roll of geomembrane delivered to the site shall be inspected by the CONTRACTOR, at a minimum, as follows:

1. The CONTRACTOR shall provide transportation, labor, and handling for delivery of the geomembrane to and from the project site. Special transportation or handling requirements required for the geomembrane shall be provided by the CONTRACTOR.

2. The equipment for transportation, handling, loading and unloading the geomembrane shall be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage or personnel injury occurring. The type, size and capacity shall be according to the MANUFACTURER and INSTALLER requirements.

3. The CONTRACTOR shall provide all equipment and labor necessary for the loading, unloading, handling, and installation of the geomembrane.

4. Upon delivery to the project site, the geomembrane material shall be inspected by the CONTRACTOR to confirm that proper labeling, transportation, handling, and storage procedures are followed. Damaged materials will be identified and repaired or rejected at the discretion of the
ENGINEER. Materials to be repaired as specified herein. Repairs will be at no additional cost to the OWNER. Rejected materials will be identified and removed from the project site at no additional cost to the OWNER.

5. Each roll shall be delivered to the site bearing markings which provide the roll number, thickness of the material, length and width of the material, and the proper direction to unroll the material to facilitate layout and positioning in the field.

6. The materials shall be unloaded by the CONTRACTOR in areas designated by the OWNER. If the OWNER has not specified a storage area, the CONTRACTOR shall determine an area for storage of the materials to meet the WORK schedule requirements. In any case the materials shall not be stored or unloaded in areas that will impair the operations of the landfill facility or be deleterious to the materials.

7. Protection shall be provided, at a minimum, from puncture, cutting, ultraviolet radiation, precipitation, dirt or other damaging or deleterious conditions.

1.07 MATERIAL AND INSTALLATION WARRANTY

A. Material shall be warranted, on a pro-rata basis against MANUFACTURER’s defects for a period of 5 years from the date of final acceptance. The warranty shall state that materials will be repaired or replaced, by the MANUFACTURER, any defective materials or products that fail to meet the design requirements. Repair or replacement of such defective material and/or products shall be completed within 30 calendar days of notification by the Owner.

B. Installation shall be warranted against defects in workmanship for a period of 2 years from the date of final acceptance. The warranty shall state the installer will repair or replace any defective work that fails to meet the design requirements. Repair or replacement of such defective work shall be completed within 30 calendar days of notification by the Owner.

C. The CONTRACTOR shall coordinate with the CQA CONSULTANT to schedule the leak location survey. The CONTRACTOR shall notify the CQA CONSULTANT at least two weeks prior to the date of the test. The leak location survey shall be performed according to the MANUFACTURERs recommendation.

D. Warranty conditions proposed by the MANUFACTURER / FABRICATOR / INSTALLER concerning limits of liability will be submitted by the CONTRACTOR and will be evaluated upon receipt and must be acceptable to the OWNER prior to installation of the geomembrane.
PART 2 - PRODUCTS

2.01 GEOMEMBRANE

A. Material shall be 60 mil textured conductive HDPE geomembrane textured on both sides as shown on the Contract Drawings and specified herein.

B. Geomembrane Rolls:

1. Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black.

2. Geomembrane shall be free of holes, blisters, undispersed raw materials, nicks and cuts on roll edges or any sign of contamination by foreign matter. If pinholes are located, identified and indicated during manufacturing, these pinholes may be corrected during installation in accordance with the MANUFACTURER’S recommendations.

3. Geomembrane material is to be supplied in roll form. Each roll is to be identified with labels indicating the information provided in Section 1.06.A.

4. The 60 mil textured conductive HDPE geomembrane shall conform to the physical properties requirements, at a minimum, as shown in Table 02778-B or the most current GRI standard for this product. Values presented in Table 02778-B are based upon standard GRI GM13 established by the Geosynthetics Research Institute (GRI) for HDPE.

5. The geomembrane shall be packaged and shipped by the MANUFACTURER in a manner to protect the integrity of the geomembrane from damage.

C. Extrudate Rod or Bead

1. Extrudate material shall be made from same type resin as the geomembrane.

2. Additives shall be thoroughly dispersed.

3. Materials shall be free of contamination by moisture or foreign matter.

D. Direct Shear Test (Interface Shear Resistance) - The CONTRACTOR will perform one Direct Shear Test in accordance with ASTM D5321 on representative samples of the Tri-axial geocomposite and 60 mil HDPE geomembrane. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the Direct Shear Testing with the results submitted to the ENGINEER:

1. Testing to be conducted under fully saturated (water) conditions.

2. Three Normal Loads = 1,000, 8,000, and 16,000 psf.
3. Test Configuration: Tri-axial geocomposite clamped to top box textured geomembrane clamped to bottom box

4. Strain Rate = 0.040 in/min.

5. Continue testing to ensure a full 3 inches of displacement.

6. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.

7. A minimum PEAK value of 0 psf adhesion and 20.5° for the interface friction angle is required for this project (based upon the best fit line).

8. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

E. Direct Shear Test (Interface Shear Resistance) - The CONTRACTOR will perform one Direct Shear Test in accordance with ASTM D5321 on representative samples of the tri-planar geocomposite and 60 mil HDPE geomembrane. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the Direct Shear Testing with the results submitted to the ENGINEER:

1. Testing to be conducted under fully saturated (water) conditions.

2. Three Normal Loads = 1,000, 8,000, and 16,000 psf.

3. Test Configuration: tri-planar geocomposite clamped to top box textured geomembrane clamped to bottom box

4. Strain Rate = 0.040 in/min.

5. Continue testing to ensure a full 3 inches of displacement.

6. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.

7. A minimum PEAK value of 0 psf adhesion and 20.5° for the interface friction angle is required for this project (based upon the best fit line).

8. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

2.02 CQA CONFORMANCE TESTING

A. In-Plant Conformance Sample Testing Services - The OWNER’S REPRESENTATIVE and CQA CONSULTANT have qualified personnel to collect conformance samples directly at the following facilities:

- GSE Lining Company
- AGRU America
• Poly-Flex, Inc.

1. Conformance sample(s) of the geomembrane will be collected by the OWNER’S REPRESENTATIVE or CQA CONSULTANT prior to shipment to the site.

2. Conformance sample(s) of the geomembrane will be tested by the CQA CONSULTANT prior to shipment to the site.

3. The CONTRACTOR shall coordinate with the MANUFACTURER, CQA CONSULTANT, and OWNER to schedule the date of delivery of the geomembrane to the site.

4. The CONTRACTOR shall inform, in writing, the CQA CONSULTANT and ENGINEER 14 days prior to the actual date of shipment from the MANUFACTURER. Geomembrane shall not be shipped prior to testing without OWNER’S approval.

5. Geomembrane products shipped to the site without prior sampling and approved conformance test results shall be sampled and tested upon delivery to the project site by the CQA CONSULTANT. All costs associated with collecting and shipping samples from the project site will be the CONTRACTOR’S responsibility. The CONTRACTOR shall allow a minimum of 7 days for sampling and testing approval of geomembrane materials upon delivery to the project site prior to installation.

6. Once sampled at the MANUFACTURER’S plant geomembrane products shall not be added or removed from the shipment. Upon addition or removal of products the following conditions shall prevail:

   a. Geomembrane products added shall be sampled for conformance testing at the CONTRACTOR’S expense.

   b. Individual geomembrane products removed from the shipment, which have been previously sampled or tested - Additional samples that have identical lot or batch numbers shall be sampled for conformance testing at the CONTRACTOR’S expense.

B. Conformance Sample Test Frequency (CQA) - The geomembrane shall be randomly sampled and tested by the OWNER’S REPRESENTATIVE or CQA CONSULTANT at a minimum of one sample per lot but at a rate of not less than one sample every 100,000 square feet of installed material from consecutively numbered rolls, whichever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the OWNER’S expense.

C. The initial conformance tests shall include the following:
### TABLE 3. REQUIRED CONFORMANCE TESTING

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>ASTM D5994</td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM D4218</td>
</tr>
<tr>
<td>Carbon Black Dispersion</td>
<td>ASTM D5596</td>
</tr>
<tr>
<td>Density</td>
<td>ASTM D1505 or ASTM D792</td>
</tr>
<tr>
<td>Tensile Properties (each direction)</td>
<td>ASTM D6693 Type IV</td>
</tr>
<tr>
<td>Geomembrane/GCL Interface Friction Angle</td>
<td>ASTM D5321</td>
</tr>
<tr>
<td>Geomembrane/tri-planar Interface Friction Angle</td>
<td>ASTM D5321</td>
</tr>
<tr>
<td>Geomembrane/Tri-axial Interface Friction Angle</td>
<td>ASTM D5321</td>
</tr>
</tbody>
</table>

Note: Required test results shall be in conformance with Table 02778-B.

D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The averaged test results of the geomembrane samples shall meet or exceed the Contract Documents and Specifications.

E. Samples that do not satisfy the Contract Documents and Specifications shall be cause to reject applicable rolls. If a geomembrane sample fails to meet Contract Documents and Specifications, subsequent tests shall be performed at random on additional geomembrane samples produced from the same resin batch to determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. This additional testing, at no additional cost to the COUNTY, may be performed to more closely identify the rolls which do not comply with the specifications. Rejected rolls will not be installed and shall be removed from the project site at no additional cost to the OWNER.

F. The CQA CONSULTANT will conduct one test on the actual extrudate welding rod used in the field for seaming and repairing the geomembrane panels to verify the material is compatible with the geomembrane. The tests shall consist of the following:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>(ASTM D792 Method A or ASTM D1505)</td>
</tr>
<tr>
<td>Carbon Black Content</td>
<td>ASTM D4218</td>
</tr>
</tbody>
</table>

### PART 3 - EXECUTION

#### 3.01 GEOMEMBRANE SUBBASE

A. Surface to be lined shall be smooth and tested in accordance with Section 02220 Excavating, Backfilling and Compaction for Subbase Material. The area shall be free of all rocks (greater than ½-inch in any dimension), sticks (greater than ½-inch in diameter), roots, grass, refuse, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the geomembrane with no...
sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

B. All areas that have been subject to erosion shall be repaired as required in Section 02220 Excavating, Backfilling and Compaction. The repaired surface for geomembrane placement shall be even with no abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

3.02 EQUIPMENT

A. Welding equipment and accessories shall, at a minimum, meet the following requirements:

1. Gauges showing temperatures in apparatus (extrusion welder) or wedge (wedge welder) shall be present.

2. MANUFACTURER approved wedge welders for bonding conductive HDPE liner.

3. An adequate number of welding apparati shall be available to avoid delaying WORK.

B. Power source must be capable of providing constant voltage under combined line load.

3.03 DEPLOYMENT

A. All activities by personnel and equipment in the vicinity of the geomembrane during and after geomembrane placement shall be monitored by the CONTRACTOR to insure that the geomembrane and geomembrane foundation are not damaged.

B. Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.

C. Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas. Field panels shall not be placed if any of following conditions exists: inadequate geomembrane foundation, precipitation, presence of excessive moisture (i.e. fog, dew), ponded water, or presence of excessive winds.

D. Prior to welding, deploy panels in a “shingle” manner, wherein the upgradient panel overlays the downgradient panel.

E. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:

1. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage (spreader bar, protected equipment bucket).
2. Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift. The CONTRACTOR shall have sufficient sand bags or other appropriate anchoring materials on site to secure the geomembrane. CONTRACTOR shall replace or repair all geomembrane damaged (as determined by the ENGINEER) by wind or insufficient anchoring at no additional cost to the OWNER.

3. Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage it. Smoking will not be permitted on the geomembrane.

4. Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV’s and trucks are acceptable if wheel contact is less than 6 psi.

5. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.

F. Sufficient material (slack) shall be provided to allow for thermal expansion and contraction of the material. The geomembrane shall be installed so as to conform to the contours and grade breaks. The geomembrane shall remain in contact with the underlying soils. Sand bags or excess material, placed during deployment, shall be used to prevent bridging due to temperature or installation procedures. Allowances for additional material due to temperature and installation procedures shall be included in the bid and at no additional cost to the OWNER.

G. “Fishmouths” or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

H. If the INSTALLER proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained and shall be submitted to the ENGINEER for review and approval 72 hours in advance. Alternate seaming operations will not be allowed without prior approval from the ENGINEER. If during the course of the WORK, the ENGINEER, CQA CONSULTANT, or OWNER decides the WORK is inadequate, the CONTRACTOR shall adjust operations as required or WORK shall ceased. Contract Documents and Specifications for placing and seaming the geomembrane shall apply to all WORK conditions.

3.04 FIELD SEAMING

A. Seams shall meet the following requirements:

1. To the maximum extent possible, orient seams parallel to line of slope, i.e., down and not across slope.
2. Minimize number of field seams in corners, odd-shaped geometric locations and outside corners.

3. Slope seams (panels) shall extend a minimum of five-feet beyond the grade break into the flat area.

4. Use a sequential seam numbering system compatible with panel numbering system that is agreeable to the CQA CONSULTANT and INSTALLER.

5. Align seam overlaps consistent with the requirements of the welding equipment being used. The panels of geomembrane have a finished overlap of 4 inches for extrusion welding and 6 inches for fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam.

B. During welding operations provide at least one Master Seamer who shall provide direct supervision over other welders as necessary.

C. Extrusion Welding
   1. Hot-air tack adjacent pieces together using procedures that do not damage the geomembrane.
   2. Clean geomembrane surfaces by disc grinder or equivalent.

D. Hot Wedge Welding
   1. Welding apparatus shall be a self-propelled device equipped with an electronic controller which displays applicable temperatures.
   2. Clean seam area of dust, mud, moisture and debris immediately ahead of hot wedge welder.
   3. Protect against moisture build-up between sheets.

E. Trial Welds
   1. Perform trial welds on geomembrane samples to verify welding equipment is operating properly.
   2. Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.
   3. Minimum of two trial welds per day, per welding apparatus, one made prior to the start of work and one completed at mid shift. (typically after lunch break). Additionally, perform trial welds at any time the welding equipment is shut down and restarted.
4. Cut four, one inch wide by 6 inch long test strips from the trial weld.

5. Quantitatively test specimens for peel adhesion and then for shear strength.

6. Trial weld specimens shall pass when the minimum results, as indicated in Table 02778-A, are achieved in both peel and shear tests.
   a. The break, when peel testing, occurs in the liner material itself, not through peel separation (FTB).
   b. The break is ductile.

7. Repeat the trial weld, in its entirety, when any of the trial weld samples fail in either peel or shear.

8. No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed trial weld.

F. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. Immediately prior to seaming procedures, the seam area shall be completely free of moisture, dirt, or foreign material of any kind. INSTALLER shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.

G. Defects and Repairs

1. Examine all seams and non-seam areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter.

2. Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations that have been repaired until test results with passing values are available.

H. Cold weather installations should follow the guidelines contained in GRI GM9.

3.05 FIELD QUALITY ASSURANCE

A. MANUFACTURER and INSTALLER shall participate in and conform to all terms and requirements of the OWNER’S CQA Plan. CONTRACTOR shall be responsible for assuring this participation.

B. Welding equipment shall be calibrated prior to each day’s welding in accordance with the Installation Plan. The INSTALLER shall record all calibration data for inclusion in the final report. Additional test welds shall be performed for each welding machine every 4 hours, if welder is turned off, prior to starting work, after lunch, or as directed by the CQA CONSULTANT.
3.06 NON-DESTRUCTIVE TESTING

A. Non-destructive testing shall be carried out as the seaming progresses. All seams shall be non-destructively tested in the presence of the CQA CONSULTANT. Insufficient seams shall be labeled, recorded, repaired and re-tested.

1. Vacuum Box Testing - Shall be performed in accordance with ASTM D5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.

   a. Shall be required for all extrusion welds, except for those welds inaccessible to the vacuum box, such as geomembrane boots. Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. Vacuum box apparatus shall be capable of sustaining a vacuum pressure 5 psi (gauge) for 10 seconds while placed on a seam. The following procedures shall be followed:

      1) Energize the vacuum pump and reduce the tank pressure to approximately 10 inches of mercury, i.e., 5 psi gauge. All gauges shall read 0 psi when the vacuum pump is not turned on. Gauges not reading 0 psi shall be replaced.

      2) Wet a strip of geomembrane approximately 4 inches by 24 inches with a soapy solution.

      3) Place the box over the wetted soapy area.

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

      5) Ensure that a leak tight seal is created.

      6) For a period of not less than 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles, which would indicate defects in the geomembrane.

      7) If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches overlap, and repeat the process.

      8) All areas where soap bubbles appear shall be marked and repaired by extrusion weld or patching.

2. Air Pressure Testing - Shall be performed in accordance with ASTM D5820, Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.
a. Testing apparatus shall be capable of generating a minimum pressure of 25 psi. Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. The air channel shall be pressurized from 25 to 30 psi and allowed to stabilize. Once stabilized, the channel pressure shall be sustained for a minimum of 5 minutes. If loss of pressure is more than 2 psi, or the pressure does not stabilize, the seam shall be rejected, the faulty area located and repaired and the seam re-tested. The following procedures shall be followed:

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

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

3) Insert a protective cushion between the air pump and the geomembrane.

4) Energize the air pump to a pressure between 25 and 30 psi, close valve, allow channel pressure to stabilize, and sustain channel pressure for approximately 5 minutes.

5) If loss of pressure is more than 2 psi or does not stabilize, locate faulty area and repair.

6) After a seam has passed a pressure test, release pressure at the end of seam that is opposite the air pump and pressure gauge assembly to ensure that the seam is continuous and has been completely tested.

3. Leak location testing will be conducted after the two feet of drainage sand has been installed over the entire area. The CONTRACTOR will coordinate testing with the CQA CONSULTANT and will notify the CQA CONSULTANT two weeks prior to testing. All leaks located will be considered faulty areas and will be repaired by the contractor at no additional cost to the CLIENT.

B. The CQA CONSULTANT shall include all results from the destructive and non-destructive seam tests into the final report.

3.07 DESTRUCTIVE TESTING

A. Performed by the CQA CONSULTANT with assistance from the INSTALLER.

B. Location and Frequency of Testing

1. Installed geomembrane shall be tested at a rate of one test per 500 linear feet of welded seam at locations selected by the CQA CONSULTANT.

2. Test locations will be determined after seaming.
C. Sampling procedures are performed as follows:

1. INSTALLER shall cut samples at locations designated by the CQA CONSULTANT as the seaming progresses in order to obtain field laboratory test results before the geomembrane is covered.

2. CQA CONSULTANT will number each sample and the location will be noted on the installation as-built.

3. The CQC CONSULTANT shall remove the sample with the seam centered lengthwise, approximately 12 inches wide across the seam by 42 inches long, and test a portion of the geomembrane seam in accordance with the CQA Plan. The location shall be recorded, repaired and tested. The repair of the destructive seam samples shall be at no additional cost to the OWNER. The CQC CONSULTANT shall distribution as follows:

   a. A 12 inch by 14 inch portion to the CQA CONSULTANT for Third Party Laboratory Quality Assurance testing.

   b. A 12 inch by 14 inch portion shall be retained by the INSTALLER for field testing.

   c. A 12 inch by 14 inch portion to the OWNER for archive storage.

4. Testing performed on each sample shall include geomembrane peel adhesion and seam strength. Seam peel strength and shear strength shall meet the requirements specified in Table 02778-A.

   Table 02779-A

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD/VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peel Strength</td>
<td>ASTM D 6392</td>
</tr>
<tr>
<td>Wedge Weld (lb/in width)</td>
<td>98</td>
</tr>
<tr>
<td>Extrusion Weld (lb/in width)</td>
<td>78</td>
</tr>
<tr>
<td>Shear Strength</td>
<td></td>
</tr>
<tr>
<td>Wedge Weld (lb/in width)</td>
<td>120</td>
</tr>
<tr>
<td>Extrusion Weld (lb/in width)</td>
<td>120</td>
</tr>
</tbody>
</table>

5. Ten 1-inch wide strips shall be cut from the CQC CONSULTANT’S portion of the sample and these shall be tested in the field by the INSTALLER.
6. Field Testing - The ten 1-inch wide strips shall be tested by the CQC CONSULTANT in the field using a tensiometer, five for peel and five for shear, and shall meet the Specifications. If any field test sample fails to pass, then the procedures outlined in Section 3.07.C.(8) shall be followed.

7. Laboratory Testing - Testing by the CQA CONSULTANT will include Seam Strength and Peel Adhesion. A total of 5 specimens will be tested from each sample for each test method. All of the 5 specimens must pass the minimum pounds per inch value listed in Table 02778-A and -B and all specimens must separate by FTB failure for each test in order for the seam to pass destructive test sampling. The results will not be averaged. Specimens will be selected alternately, by test, from the samples (i.e., peel, shear, peel, shear). The CQA CONSULTANT will provide test results to the CONTRACTOR no more than 24 hours after the samples are received at the laboratory. The only exception shall be weekends or official holidays when the laboratories are closed. Arrangements to schedule testing of destructive samples on weekends and holidays shall be approved by the CQA CONSULTANT 24 hours in advance. Additional costs for lab work on holidays or weekends shall be at no additional expense to the OWNER and shall be paid by the CONTRACTOR.

8. Procedures for Destructive Test Failure - The following procedures shall apply whenever a sample fails the destructive test, whether the test is conducted by the CQA CONSULTANT’S laboratory or by field tensiometer. The geomembrane INSTALLER shall have two options, the cost of which shall be at no additional expense to the OWNER:

a. The geomembrane INSTALLER can reconstruct the seam between any two passed test locations.

b. The geomembrane INSTALLER can trace the welding path to an intermediate location at 10 feet, minimum, from the location of the failed test in each direction, and take a specimen for an additional field test at each location. If these additional specimens pass the test, then full laboratory destructive samples shall be taken. These additional tests shall be at the expense of the CONTRACTOR. If these laboratory samples pass the test, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In any case, all acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet of reconstructed seam, a sample taken from within the reconstructed zone must pass destructive testing. Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and/or welding apparatus or welded during the same time shift. Such additional testing shall be at the CONTRACTOR’S expense.
3.08 REPAIR PROCEDURES

A. All seams and non-seam areas of the geomembrane shall be inspected by the INSTALLER and CQA CONSULTANT for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface shall be brushed, blown, or washed by the CONTRACTOR if the amount of dust, mud or debris inhibits inspection. The CQA CONSULTANT shall decide if cleaning of the geomembrane is needed to facilitate inspection. The INSTALLER shall be responsible for repair of defective areas at no additional expense to the OWNER.

B. Agreement upon the appropriate repair method shall be decided between CQA CONSULTANT and INSTALLER by using one of the following repair methods:

1. Patching - Patches shall be round or oval in shape made of the same geomembrane and extend a minimum of 6 inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only.

2. Abrading and Re-welding - Used to repair short section of a seam.

3. Spot Welding - Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.


5. Remove the unacceptable seam and replace with new material.

C. The following procedures shall be observed when a repair method is used:

1. All geomembrane surfaces shall be clean and dry at the time of repair.

2. Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.

3. Extend patches or caps at least 6 inches for extrusion welds and 4 inches for wedge welds beyond the edge of the defect, and around all corners of patch material.

D. Repair Verification

1. Each repair shall be non-destructively tested. In addition the CQA CONSULTANT may require a destructive seam sample be obtained from a repaired seam. Repairs that pass the non-destructive and/or destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.
2. Number and log each patch repair (performed by CQA CONSULTANT).

3.09 ANCHOR TRENCH

A. The anchor trench shall be excavated prior to geomembrane installation. No loose soil, roots, rocks, or materials capable of damaging the geomembrane shall be allowed beneath the geomembrane. The anchor trench shall be backfilled and compacted as indicated on the Drawings, and in a manner that prevents any damage to the geomembrane. The geomembrane shall not have sharply folded corners when placed into the anchor trench. The geomembrane shall be welded the entire length of the panel, including through the entire dimension of the trench.

3.10 OVERLYING GEOMCOMPOSITE

A. During placement of the geocomposite upon the geomembrane, precautions shall be taken to prevent damage to the geomembrane by restricting heavy equipment traffic. Unrolling the geocomposite can be accomplished through the use of lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV). This vehicle can be driven directly on the geomembrane, provided the ATV makes no sudden stops, starts, or turns.

B. Geomembrane which is covered prior to approval by the CQA CONSULTANT shall be uncovered at no additional cost to the OWNER.

C. The CONTRACTOR shall schedule his work so as to permit as much time as needed for testing and CQC/CQA documentation before placing the overlying soil layer(s).

D. The CONTRACTOR shall place the overlying geocomposite layer immediately upon approval of the geomembrane by the CQA CONSULTANT to prevent damage, uplift, or degradation of the geomembrane.

3.11 SURVEY CONTROL STAKES

A. Survey stakes in the vicinity of the geomembrane shall be placed with care as not to penetrate the geomembrane liner. Plastic traffic cones, cardboard tubes or other items as approved by the ENGINEER may be used as survey control devices.

3.12 FINAL ACCEPTANCE

A. The CONTRACTOR shall retain ownership and responsibility for the installed geomembrane until final acceptance by the OWNER.

B. Final acceptance of the geomembrane by the OWNER will occur when:

1. All installation activities are completed.
2. All documentation of installation is completed and the INSTALLER’S final report is submitted to and accepted by the ENGINEER.

3. All documents presented in Section 1.05 have been submitted to the ENGINEER and approved.

Table 02779-B

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
<th>60 mils</th>
<th>TEST FREQUENCY (minimum)</th>
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</thead>
<tbody>
<tr>
<td>Thickness (min. avg.)</td>
<td>ASTM D5994</td>
<td>nom. (-5%)</td>
<td>per roll</td>
</tr>
<tr>
<td>• lowest individual for 8 out of 10 values</td>
<td></td>
<td>-10%</td>
<td></td>
</tr>
<tr>
<td>• lowest individual for any of the 10 values</td>
<td></td>
<td>-15%</td>
<td></td>
</tr>
<tr>
<td>Asperity Height (min. avg.) (1)</td>
<td>ASTM D7466</td>
<td>16 mils</td>
<td>every 2nd roll (1) (2)</td>
</tr>
<tr>
<td>Density (min. avg.)</td>
<td>ASTM D1505/D792</td>
<td>0.940 g/cc</td>
<td>1 per 50,000 ft²</td>
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<tr>
<td>Tensile Properties (min. avg.) (3)</td>
<td>ASTM D6693 Type IV</td>
<td>126 lbs/in (min)</td>
<td>1 per 50,000 ft²</td>
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<tr>
<td>• Yield Strength</td>
<td></td>
<td>90 lbs/in (min)</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>• Break Strength</td>
<td></td>
<td>12% (each)</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>• Yield Elongation</td>
<td></td>
<td>100% (min)</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>• Break Elongation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tear Resistance (min. avg.)</td>
<td>ASTM D1004</td>
<td>42 lb</td>
<td>1 per 100,000 ft²</td>
</tr>
<tr>
<td>Puncture Resistance (min. avg.)</td>
<td>ASTM D4833</td>
<td>90 lb</td>
<td>1 per 100,000 ft²</td>
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<tr>
<td>Stress Crack Resistance (4)</td>
<td>ASTM D5397</td>
<td>500 hour min.</td>
<td>per GRI GM10</td>
</tr>
<tr>
<td>Carbon Black Content (range)</td>
<td>ASTM D4218 (5)</td>
<td>2.0 - 3.0%</td>
<td>1 per 50,000 ft²</td>
</tr>
<tr>
<td>Carbon Black Dispersion</td>
<td>ASTM D5596</td>
<td>Note (6)</td>
<td>1 per 100,000 ft²</td>
</tr>
<tr>
<td>Oxidative Induction Time (OIT) (min. avg.) (7)</td>
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<td>100 minutes min.</td>
<td>per resin lot</td>
</tr>
<tr>
<td>(a) Standard OIT</td>
<td>ASTM D3895</td>
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<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT</td>
<td>ASTM D5885</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oven Aging at 85°C (7), (8)</td>
<td>ASTM D5721</td>
<td>55%</td>
<td>per each formulation</td>
</tr>
<tr>
<td>(a) Standard OIT (min. avg.) - % retained after 90 days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT (min avg.) - % retained after 90 days</td>
<td></td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>UV Resistance (9)</td>
<td>GM11</td>
<td>N.R.</td>
<td>per each formulation</td>
</tr>
<tr>
<td>(a) Standard OIT (min. avg.)</td>
<td>ASTM D3895</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT (min. avg.)</td>
<td>ASTM D5885</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UV Resistance (9)</td>
<td>ASTM D3895</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Standard OIT (min. avg.)</td>
<td>ASTM D3895</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT (min. avg.)</td>
<td>ASTM D5885</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UV Resistance (9)</td>
<td>ASTM D3895</td>
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<td></td>
</tr>
<tr>
<td>(a) Standard OIT (min. avg.)</td>
<td>ASTM D3895</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) High Pressure OIT (min. avg.)</td>
<td>ASTM D5885</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes
(1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be ≥ 5 mils; also see Note 6.
(2) Alternate the measurement side for double sided textured sheet.
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
(4) Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches
P-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer’s mean value via MQC testing.
Other methods such as ASTM D1603 (tube furnace) or ASTM D6370 (TGA) are acceptable if an appropriate correlation to ASTM D4218 (muffle furnace) can be established.
(5) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
in all categories 1 or 2.
(6) The manufacturer has the option to select one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(7) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(8) New Hanover County Secure Landfill
Cells 7-13 Expansion Project
Conductive HDPE Geomembrane Liner (Primary)
02779-26
June 2017
(9) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

(10) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

(11) UV resistance is based on percent retained value regardless of the original HP-OIT value.

Table 02779-C
GEOMEMBRANE MANUFACTURER/INSTALLER INFORMATION

Company name__________________________________________

Years of geomembrane installation experience__________________

Square feet installed_____________________________________

Raw material used_______________________________________

Sheet width manufactured (ft.)_____________________________

Sheet width delivered (ft.)_______________________________

Field Supervisor years of experience________________________

Square feet of geomembrane supervised_______________________

Delivery time after approved layout drawings_______________ weeks

Detailed company experience information attached _______yes_______no

END OF SECTION
SECTION 02920

TOPSOIL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The WORK specified in this Section consists of furnishing all necessary labor, equipment, material and transportation necessary to furnish, place and prepare topsoil ready for planting.

B. Topsoil shall be at least 4-inches deep for sod and 6-inches deep for seeding.

1.02 QUALITY ASSURANCE

A. Certification: When requested, the CONTRACTOR shall provide the necessary certification of topsoil that conforms to these requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil shall be free of roots, brush, stumps, gravel, stones, heavy clay, frozen clods, cinders, slag, coarse fragment, trash or other extraneous materials and suitable for or capable of supporting the growth of grass or other plant life.

B. Topsoil shall be fertile, friable natural surface soil (i.e., loam, sandy loam, clay loam, silt loam, sandy clay loam or loamy sand) from well-drained sites. It shall not have a mixture of contrasting texture subsoil and shall not be delivered while in a muddy condition.

C. Topsoil shall be obtained from an off-site source and as delivered to the site shall have an acidity range of pH 6.0 to 7.5 and shall contain not less than 15 percent organic matter by weight. If pH value is less than 6.0, lime shall be applied and incorporated with the topsoil to adjust the pH to 6.5 or higher. Lime shall consist of ground dolomitic limestone containing not less than 85 percent calcium and magnesium carbonate ground to permit 50 percent by weight to pass a No. 100 mesh screen and 90 percent to pass a No. 20 screen. Topsoil continuing soluble salts greater than 500 parts per million shall not be used. Topsoil sample tests for organic matter content, pH and soluble salts, if required, shall be made at the discretion of the ENGINEER.

D. Topsoil must be free of plants or plant parts of Bermuda grass, quack grass, Johnsongrass, nutsedge, poison ivy, thistles, or other perennial weeds or wood vegetations. No sod or seed shall be placed on soil which has been treated with
soil sterilants or chemicals used for weed control until sufficient time has elapsed to permit dissipation of toxic materials.

PART 3 - EXECUTION

3.01 PREPARATION

A. Fine Grading: After structures, berms and pavements are completed and the piping trenches backfilled, the disturbed areas of the site shall be fine graded. Any lumber, undesirable materials and rocks larger than the 1-inch in size shall be removed from the surface and the surface shall be prepared for topsoil. The completed surface shall be shaped and sloped to drain water away from the structures. The completed surface shall be within 0.1-foot of the elevations shown on the Drawings, unless otherwise approved by the ENGINEER. Grades on the areas to be topsoiled that have been previously established shall be maintained.

B. Liming: Where the topsoil is highly acid, ground limestone shall be spread at the rate of 2 tons/acre (92 pounds per 1,000 square feet). Lime shall be distributed uniformly over designated areas and worked into the soil in conjunction with tillage operations as described in the following procedures.

C. Tilling: After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or by scarifying to a depth of at least 2 inches to permit bonding of the topsoil to the subsoil. Pack by passing a bulldozer up and down over the entire surface area of the slope to create horizontal erosion check slots to prevent topsoil from sliding down the slope.

D. Grading: The topsoil shall be uniformly distributed to a minimum of six (6) inches for seed and a minimum of four (4) inches for sod. Spreading shall be performed in such a manner that sodding or seeding can proceed with a minimum of additional soil preparation and tillage. Any irregularities in the surface resulting from topsoiling or other operations shall be corrected in order to prevent the formation of depressions or water pockets. Topsoil shall not be placed while in a muddy condition, when the subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading and seedbed preparation. Topsoil shall not be compacted. Immediately following placement of topsoil, the entire area shall be raked free of stones.

E. Dust Control: Provisions must be made to control dust during final grading. Water may be applied to the topsoil for dust control.

END OF SECTION
SECTION 02930

SODDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The extent of sodding consists of supplying and planting sod in the locations shown on the drawings generally limited to the run of the swales, side slopes of the percolation basin, and in those areas where construction activity has damaged or destroyed the ground cover to the point where erosion may occur during a storm event.

B. The sodding WORK shall include, but not be limited to, supplying all labor, materials, and equipment necessary to perform sodding, fertilizing, watering, mowing, and cleanup.

1.02 QUALITY ASSURANCE

A. The ENGINEER reserves the right to test, reject, or accept all materials before application.

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical, analysis, and name of manufacturer.

B. The CONTRACTOR shall, at the time of delivery, furnish the ENGINEER invoices of all materials received in order that the minimum application rate of materials may be determined. Failure to supply invoices at the time of delivery will warrant that payment for those items be delayed until proper submittal of invoices is obtained and the minimum application rates of material may be verified.

PART 2 - PRODUCTS

2.01 SOD

A. Sod shall be Coastal Bermuda or Centipede Bahia with well matted roots.

B. The sod shall be commercial size rectangular measuring 12-inches by 24-inches or larger.

C. The sod shall be sufficiently thick to secure a dense stand of live grass, with a minimum thickness of 2-inches. The sod shall be live, fresh and uninjured at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to
the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses.

D. Sod shall be planted as soon as possible after being harvested and shall be shaded and kept moist from the time of harvesting until it is planted.

E. The source of the sod may be inspected and accepted by the ENGINEER prior to construction.

2.02 FERTILIZER

A. The fertilizer shall be a commercial granular type with a chemical designation of 12-8-8.

B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water soluble potash, contained in the fertilizer.

1. At least 50 percent of the phosphoric acid shall be from a normal super phosphate or an equivalent source which will provide a minimum of two units of sulfur.

2. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag of container.

C. Commercial fertilizers shall comply with the State fertilizer laws.

D. Fertilizer may, at the discretion of the ENGINEER, upon satisfactory evidence of its feasibility from the manufacturer, be applied in liquid form.

2.03 WATER

A. The water used in the sodding operations may be obtained from any approved spring, pond, lake, stream, or municipal water system.

B. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance which might be harmful to plant growth or obnoxious to traffic.

C. Salt water shall not be used.

PART 3 - EXECUTION

3.01 GENERAL

The order of work for sod installation shall be as follows:

A. Fine grading
B. Removal of debris
C. Application of fertilizer
D. Placement of sod  
E. Clean-up  
F. Watering  

3.02 SOIL MANIPULATION  
A. All soil manipulation shall be done at right angles to the direction of the slope.

3.03 FINE GRADING  
A. After removal of debris, fine grading shall be performed as required to bring all areas to receive grass to an acceptable smooth and finished grade. Areas to receive grass shall be fine graded by raking to eliminate wind rows, ridges, depressions and other irregularities.

B. All sodded areas bordered by paving shall have a finished grade (top of the sod) that is ½" below the grade established by the adjacent paving. All sodded areas bordered by planting areas shall have a finished grade (top of the sod) that is two inches above the soil level in the adjacent planting bed.

3.04 REMOVAL OF DEBRIS  
A. Areas to receive grass shall be cleaned of all stones larger than 1" in diameter, sticks, stumps, paper, glass, and other debris which might interfere with the placement of sod, growth of grass or subsequent maintenance of grass area. All weeds shall be removed from areas to be sodded.

3.05 APPLICATION OF FERTILIZER  
A. If fertilizer not already applied to topsoil, fertilizer (and/or lime) shall be spread uniformly as specified below.

1. Fertilizer application of 500 lbs. per acre.

2. Lime shall be spread at a minimum uniform rate of 250 lbs. per acre and thoroughly mixed with the soil to a depth of 4-inches.

B. Fertilizing operations will not be permitted when wind velocities exceed 15 miles per hour.

3.06 PLACING OF SOD  
A. Sod size shall be as previously specified. The setting of pieces shall be staggered in such a manner as to avoid continuous seams where possible. Sod shall be moist and shall be placed on a moist earth bed. Sod shall be carefully placed by hand, edge to edge in rows at right angles to the slope, commencing at the base of the area to be sodded and working upward. Sod shall be immediately pressed firmly into contact with the sod bed by rolling with a one ton roller or any other
approved equipment. The rolling operation shall provide a true and even surface and insure knitting without displacement of sod or deformation of the surfaces. Sod located on slopes should be placed carefully enough so that rolling with a power roller is not necessary. Sod located around retention areas, along pavement areas, or in swales may require staking. The repair of any erosion or sod relocation necessary prior to the sod becoming firmly rooted to the existing soil will be the responsibility of the CONTRACTOR. Stakes, if used, shall not interfere with the mowing of the lawn areas. All sod placed in areas with slopes 4:1 or steeper shall be staked, unless agreed to otherwise by the ENGINEER.

B. The CONTRACTOR shall ensure that the finished grade of sod placed directly adjacent to buildings or other walls does not vary more than ½” from a ten foot long straight edge.

3.07 CLEAN UP

A. Upon completion of the work, all debris, fertilizer bags, pallets, etc. shall be removed from the site. Any paved areas including curbs and sidewalks shall be thoroughly swept.

3.08 WATERING

A. The sod shall be kept in a moist condition after planting and for the duration of the Contract. Water shall be applied between the hours of 10:00 a.m. and 4:00 p.m.

3.09 MAINTENANCE

A. The CONTRACTOR shall, at his expense, maintain the planted areas in satisfactory condition for a period of 90 days after completion of the work. Such maintenance shall include watering, filling, leveling, and repairing any washed or eroded areas and additional fertilizer and sod applied to areas where satisfactory stand of grass has not been achieved.

B. Immediately prior to final inspection, the CONTRACTOR shall mow and remove clippings from the areas grassed under this Contract.

3.10 ACCEPTANCE

A. The CONTRACTOR shall schedule the laying of sod to allow the sod to be well established prior to the date of final completion. The OWNER shall not accept the sod unless the roots have grown into the top soil and the sod cannot be raised. The sod shall also show signs of health and good growth.

END OF SECTION
SECTION 02932

SEEDING AND MULCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work consists of establishing a stand of grass on the Cell 7-13 project area exclusive of the interior slopes and bottoms of the disposal area, areas to be sodded, bottom of the percolation basin, and on areas disturbed by the CONTRACTOR. The CONTRACTOR will be responsible for maintaining it for a period of 90 days after completion of the work. Also included are mulching, fertilizing, watering, and maintenance as required to produce a healthy stand of grass.

B. The Contractor’s landscaping company shall be utilized for this portion of the Work. The CONTRACTOR shall coordinate all Work activities described within this Section directly with the landscaping company.

1.02 SUBMITTALS

A. Certification: Certification of quality by producer shall be delivered to ENGINEER ten days prior to use.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Seed: Grass seed shall be Common Bermuda, bahia grass, mixed with winter rye species available locally and be placed as stated in 3.02.A. below.

B. Synthetic Mulch: Erosion control mulching fabric shall be S-75 Erosion Control Straw Blanket as supplied by North American Green, or equal.

C. Wood Fibre Mulch (or equal):
   1. Conwed Hydro Mulch Fibers.
   2. Conwed Hydro Mulch 2000 Fibers.

D. Mulch: Straw.

E. Fertilizer: The chemical designation of fertilizer shall be as recommended by the Cooperative Extension Service and shall comply with the State fertilizer laws.
PART 3 - EXECUTION

3.01 PREPARATION

A. Preparation Of Area To Be Seeded: The ground to be seeded shall have 6 inches of topsoil placed according to Section 02920 – Topsoil. The topsoil layer shall be prepared for fertilizing and seeding by disc harrowing and thoroughly pulverizing the soil to a depth of 3 to 4 inches. The prepared soil shall be loose and reasonably smooth. It shall be reasonably free of large clods, roots and other material that will interfere with the work and subsequent mowing and maintenance operations. Hand picking may be required.

B. Soil analysis: Before applying fertilizer, the topsoil soil characteristics, including pH, shall have met the requirements of Section 02920 – Topsoil.

3.02 APPLICATION

A. General:

1. Weather Limitations: Fertilizing, seeding, or mulching operations will not be permitted when wind velocities exceed 15 miles per hour. Seed shall be sown only when the soil is moist and in proper condition to induce growth. No seeding shall be done when the ground is frozen or is unduly wet, or otherwise not in a tillable condition.

2. Sequence Of Operations: The operations involved in the work shall proceed in the following sequence: Preparation and fertilizing of the ground, seeding, and installation of mulch, and placement of erosion control fabric on slopes greater than 3 horizontal to 1 vertical slope ratio.

B. Fertilizing and Seeding: While the soil is still loose and moist, the seed shall be scattered uniformly over the grassing area.

C. Rolling: Immediately after completion of the mulching, the entire seeded and mulched area shall be rolled thoroughly with the equipment specified. At least two trips over the entire area will be required.

D. Mulching fabric:

1. Mulching fabric shall be installed in accordance with the manufacturer's directions as required by the conditions.

2. On slopes greater than 3 horizontal to 1 vertical slope ratio, mulching fabric shall be applied parallel to the slope direction. In drainage swales, mulching fabric shall be installed parallel to the direction of flow.

3. Fabric shall be draped loosely, without stretching, so that continuous ground contact is maintained.
4. Overlapping and joining of adjacent rolls of fabric should be done in accordance with the manufacturer's instructions.

5. Where mulching fabric is not required, straw mulch or wood fiber mulch shall be applied at the following rates:
   a. Straw mulch shall be applied at a rate of 1000 pounds per acre.
   b. Hydraulic Mulching: Wood fiber mulch shall be applied at the following rates:
      1) Flat surfaces to 3 to 1 slopes    1,000 lbs./acre
      2) Critical areas, and > 3 to 1 slopes    erosion control fabric

E. Watering: The seeded area shall be watered so as to provide optimum growth conditions for the establishment of the grass. In no case, however, shall the period of maintaining such moisture be less than one week after the planting.

F. Single Hydraulic Application: Using the standard hydraulic mulching equipment, the wood fiber mulch, seed, and fertilizer, may be applied as a combined slurry in a single application, provided that the seed and fertilizer are increased by 25% by weight.

G. Maintenance:
   1. The CONTRACTOR shall, at his expense, maintain the seeded areas in a satisfactory condition for 90 days after completion of the work. Such maintenance shall include the repairing of mulching fabric or any damaged areas where the establishment of the grass stand does not appear to be developing satisfactorily, or where erosion has washed away an area and filling and leveling are required.
   2. Replanting or repair necessary due to the CONTRACTOR's negligence, carelessness or failure to provide routine maintenance shall be at the CONTRACTOR's expense.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. The WORK specified in this Section includes the manufacture, testing, and installation of a geosynthetic rain tarp as shown on the Contract Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit MANUFACTURER’S test reports and data, specifications, installation instructions, and roll dimensions.

B. Submit copies of evaluation reports provided by the MANUFACTURER demonstrating that properties for the materials comply with Specification requirements.

C. The MANUFACTURER shall warrant, in writing, the material for 5 years on a pro rata basis. The warranty shall apply to normal use and service in a sanitary landfill environment under exposure to sanitary landfill gas and leachate as well as other exposures which can be anticipated from the intended use.

D. Submit MANUFACTURER’S information regarding UV-resistant sand bag material.

E. ENGINEER’S approval shall be obtained prior to the use of any materials in the project.

1.03 PROTECTION AND STORAGE

A. Each roll of material shall have a MANUFACTURER’S identification label. Each roll shall be labeled to provide product identification adequate for inventory and quality control purposes. The label shall provide, as a minimum, the MANUFACTURER’S name, product identification, lot number, roll number, and roll dimensions. Rolls shall be labeled as per ASTM D4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

B. Materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geosynthetic to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.

C. Rolls of material should not be stacked upon one another to the extent that deformation of the core occurs. Outdoor storage shall not exceed six months.

PART 2 - PRODUCTS
2.01 GEOSYNTHETIC RAIN TARP

A. Material shall be a scrim-reinforced polyethylene or a polymer type membrane such as Dura-Skrim 12BBR as manufactured by Raven Industries or a ENGINEER’S approved substitution conforming to the following minimum properties:

<table>
<thead>
<tr>
<th>CHARACTERISTICS</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Thickness</td>
<td>12 mil</td>
</tr>
<tr>
<td>Moisture Vapor Transmission</td>
<td>0.36 g/m²-day or less</td>
</tr>
</tbody>
</table>

B. The material shall be tested by the MANUFACTURER for the compliance with the following properties:

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>TEST METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permeability</td>
<td>ASTM D4491 or ASTM E96</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D751</td>
</tr>
<tr>
<td>Grab Tensile</td>
<td>ASTM D751</td>
</tr>
<tr>
<td>Moisture Vapor Transmission</td>
<td>ASTM E96</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.01 INSTALLATION

A. The rain tarp shall be installed to cover the surface of the drainage sand within the entire eastern portion of Cell 7 or Cells 7 & 8A. Installation will be in accordance with the MANUFACTURER’S recommendations. At a minimum the rain tarp will be anchored on all four edges and cover 50% of the cell. Ballast, such as sand bags or tires (provided by CLIENT), shall be placed on the rain tarp to avoid uplift due to wind and spaced at intervals on a 50-foot by 50-foot grid on the floor of the cell and at the top, middle and bottom of the slope on the berms. Sand bag material shall be UV-resistant. No equipment shall be allowed to operate on the rain tarp, and any tears or damage to the rain tarp shall be repaired prior to placement. The surface of the rain tarp shall be kept relatively clean and free of debris during installation. Any damage to the liner systems or any other features shall be repaired as directed by the ENGINEER at the CONTRACTOR’S expense.

B. Sheets shall be joined in accordance with the MANUFACTURER’S recommendations.

C. The CONTRACTOR shall place all cover materials in such a manner to prevent damage to the materials, slippage of the underlying layers, and excessive tensile stresses in the materials.
3.02 REPAIRS

A. Rain tarp damaged during placement or before final acceptance shall be replaced or repaired at the CONTRACTOR’S expense in accordance with MANUFACTURER’S recommendation. The CONTRACTOR shall be responsible for the documentation of repairs describing location and type of repair. Repair documentation shall be submitted to the ENGINEER.

PART 4 – STORMWATER

4.01 STORMWATER PUMP & HOUSING

A. The Stormwater Pump will be place on top of the rain tarp above the Cell 7 sump set vertically in the Stormwater Pump Housing as show on the Contract Drawings. The pump and housing will be placed after the rain tarp is installed and will operate on a float system controlled by the pump panel. All wiring for the housing and floats will be placed per field conditions, at a minimum of 2’ below ground until it daylights at the anchor trench to run over the liner to the pump. All wiring will be protected by underground conduit from the panel to the breaker boxes. The conduit will be sealed on both ends (at the panel and at the breaker box) to keep liquids and gasses from traveling through the conduit. From the breaker boxes to the pump the power cable and float control cable will not be in conduit. Tie the two cables together at 15 foot intervals for the run of the wire using a UV resistant cord.

B. Note that the pump discharge will be a three inch hose that will discharge into the stormwater drop inlet located at the northeast corner of Cell 7.

C. All edges of the Stormwater Pump Housing that could come in contact with the rain tarp shall be rounded and smoothed to prevent the housing from causing damage to the rain tarp.

D. The CONTRACTOR is responsible for pumping off stormwater that accumulates in the cell and on the rain tarp until final acceptance of the cell.

END OF SECTION
DIVISION 3

CONCRETE
SECTION 03410

PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work under this Section includes the design, casting, delivery and erection of concrete structures as indicated on the Drawings. Precast concrete open throat drop inlets shall meet the requirements of the North Carolina Department of Transportation standard drawing 840.04 with a 6-inch opening.

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall be in accordance with the current editions of the following standards:

2. ACI 318, Building Code Requirements for Reinforced Concrete.
3. PCI MNL 116, Manual for Quality Control for Plants and Production of Precast Concrete Products.

1.03 SUBMITTALS

A. The following information shall be submitted for approval. Fabrication shall not begin until submission has been approved.

1. Quality Control: Satisfactory evidence shall be submitted that plant and production methods meet the requirements of PCI MNL 116.
2. Shop Drawings: Complete fabrication and erection drawings shall be submitted. All drawings shall bear the seal of a Professional Engineer registered in the State of North Carolina.

B. Manufacturer's data sheets shall be submitted on the following:

1. Joint mastic and gaskets.
2. Pipe connections.
3. Grout material.
4. Hatches.
1.04 DELIVERY, STORAGE AND HANDLING

A. Transportation and erection shall be done by qualified personnel using proper equipment. Lifting and supporting shall be done only at points indicated on the shop drawings.

1.05 MANUFACTURERS

A. Years of Experience (5 year minimum).

B. References

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Precast Concrete Structures:

1. Design loads shall consist of dead load, live load, impact, and soil loads, as well as other loads that may be imposed upon the structure. The minimum wall thickness shall be 8 inches.

2. Forms used for precast concrete shall be of metal and sufficiently designed and braced to maintain their alignment under pressures of the concrete during placing. Base and first section of precast structures shall be an integral cast.

3. Aggregates. All aggregates, fine and coarse, other than lightweight aggregate shall conform to ASTM C 33. Lightweight aggregates, fine and coarse, shall conform to ASTM C 330. Aggregates shall be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Both types of aggregate shall be graded in a manner so as to produce a homogenous concrete mix. All materials are to be accurately weighed at a central batching facility for mixing.

4. Cement shall be Portland cement Type II.

5. Minimum compressive strength of concrete used for precast concrete structures shall be 4,000 psi at 28 days.

6. Placing. All concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit is completed. Maximum elapsed time from batching to placement shall be 2 hours. Concrete shall be placed in layers not over 2 feet deep. Each layer shall be compacted by mechanical internal or external vibrating equipment. Duration of the vibration cycle shall be
limited to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

7. Curing:

a. For purposes of early reuse of forms, precast concrete may be steam cured after an initial set has taken place. The steam temperature shall not exceed 160°F, and the temperature shall be raised from normal ambient temperatures at a rate not to exceed 40°F per hour.

b. The steam cured unit shall not be removed from the forms until sufficient strength is obtained for the unit to withstand any structural strain to which it may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may be used, and shall be of a clear or white type, conforming to ASTM C 309.

8. Reinforcing steel shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be Grade 60.

9. Joints shall be tongue and groove pipe ends sealed with round or other flexible type natural rubber joint ring gaskets in conformance with ASTM C 433 or by a flexible preformed bitumastic sealing material equal to Ram-Nek as manufactured by R.K. Snyder and Co., Houston, Texas. If rubber joint ring gaskets are used, interior and exterior voids in the pipe joints shall be sealed with flexible sealing material specified above, installed in strict accordance with the manufacturer's printed instructions. If sections are sealed with a flexible preformed bitumastic sealing material, adequate material shall be applied so that "squeeze out" occurs at the interior and exterior of the joint. Rubber joint ring gaskets and flexible preformed bitumastic sealing material shall be provided by the manufacturer.

10. Lifting holes through the structures are not permitted. Equally spaced lifting lugs, rings or non-penetrating lift inserts shall be provided.

11. Top slabs may be precast or cast-in-place. Concrete for top slabs shall have a compressive strength of 4,000 psi at 28 days. Thickness of concrete for top slabs shall be a minimum of 6 inches for stormwater structures, shallow manholes and 8 inches for pumping station wetwells.

12. Exterior surfaces of precast structures shall be coated with a primer coat and three finish coats of coal tar epoxy. The epoxy shall be Carboline 300M or equal.

B. Sealing Compound and Grout: Plastic sealing compound shall comply with Federal Specification SS-S-00210. Mortar shall comply with ASTM C 387, Type S, or use grout complying with Division 3.

C. Pipe Connections: Pipe connections for wall penetrations for valve vaults shall be provided with wall sleeves and link seals or as specified in Section 15050.

D. Aluminum Access Hatches: Aluminum hatches shall be provided for wetwells and valve vaults sized as indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Earthwork: The Contractor shall prepare an excavation large enough to accommodate the structure and permit sealing of openings, waterproofing, and backfilling operations. Earthwork shall conform to the applicable sections of Division 2.

B. Installation of Precast Concrete Structures: Precast concrete structures shall be constructed in a workmanlike manner at the locations and dimensions indicated on the Drawings. Precast structures shall be set on a foundation of crushed stone, 12 inches thick. Crushed stone material shall be a well graded crushed stone or crushed gravel meeting the requirements of ASTM C33, Gradation No. 67 (3/4-inch to No. 4 sieve). The precast structures shall be constructed such that the structure will not transmit dead or live loads to the piping. Care shall be taken to prevent earth and other material from entering precast structures.

C. Sealing and Grouting: Fill all interior and exterior joints between precast sections with a joint sealant, as recommended by the structure manufacturer.

D. Installing Precast Sections:

1. Set each precast concrete unit plumb on a bed of sealant to make a watertight joint at least 1/2-inch thick with the concrete base or with the preceding unit. Point the inside joint and wipe off the excess sealant.

2. Assemble units so that the cover conforms to the elevations shown on the Drawings.

3. Pipe connections at precast structures shall be provided at the locations shown on the Drawings. Connections shall be resilient and waterproof.
4. All voids in interior and exterior section joints and lift holes shall be filled with a non-shrinking, non-metallic grout. Grout shall be applied and cured in strict accordance with the manufacturers recommendations. The grout shall be finished smooth and flush with the wall surface.

E. Backfill: After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits designated on the Drawings. Backfill material shall consist of sand or loose earth, free from stones, clods, or other deleterious material. It shall be placed in conformance with the requirements of Division 2.

END OF SECTION
DIVISION 11

EQUIPMENT
SECTION 11300

PUMPS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The WORK specified in this section consists of furnishing one leachate collection pump and spare, one leachate detection pump and spare, and one stormwater pump with associated materials and equipment; and installing the leachate pumping systems including one collection submersible and one detection submersible pump and one stormwater pump, pipe connections, flow meters, sampling ports, the secondary discharges to be connected to the primary risers and related equipment which should be fully tested and in operating conditions as shown on the Drawings and Specifications.

1.02 QUALITY ASSURANCE

A. Unit Responsibility: The pumps, motors, control elements, carriage, discharge hose, and appurtenances shall be supplied by the pump supplier to assure unit responsibility. The pump supplier shall have experience in providing complete systems and equipment for leachate removal.

B. Pumps and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

C. The CONTRACTOR shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the OWNER of any discrepancy before performing the work.

D. Factory Tests: Pumps shall be tested by the manufacturer or a nationally recognized testing agency in compliance with Hydraulic Institute Standards. The pump supplier shall perform the following tests on each pump before shipment from the factory. Certified test results shall be submitted to the OWNER.

1. Meg the pump to check for insulation breaks or moisture.

2. Run the pump dry for a minimum of five minutes to ensure integrity of mechanical seal and oil lifter. Also check rotation of electric motor in both directions.
E. Parts Stocking Program: The pump supplier shall provide the owner the following spare parts which should be retained on the landfill site for use as necessary.

- Spare Power Cable – 75 feet in length (Includes cable entrance and gland fittings).
- Spare Transducer – 75 feet of signal cable (Transducer is to be surge suppressed).

F. Each submittal for equipment, components or system components shall be accompanied by an “Equipment Warranty and Certification Form.” The form shall be duly executed by an authorized principal of the manufacturer warranting and certifying that the equipment and system components proposed meets or exceeds the specifications, is suitable for its intended purpose and will provide satisfactory performance at the design criteria specified. In the event that the manufacturer is not the supplier, an authorized principal of the supplier shall also execute the equipment warranty and certification form.

1.03 SUBMITTALS

A. The CONTRACTOR shall provide shop drawings prepared by the manufacturer and submit to the engineer for review prior to the manufacture of the proposed equipment. The shop drawings shall include outline dimensions and external connection diagrams. A list of components, pump performance curve showing performance from shutoff to run out as well as a copy of the manufacturers warranty shall be included with each submittal. The manufacturer shall provide to the contractor the required number of submittals at no extra cost to the contractor. In addition the shop drawings shall include the following:

1. Full description and schematic of mechanical seal design, operation and protection devices, including oil lifter design and operation.

2. Full description and schematic of motor cable entrance. Must indicate anti wicking device as well as cable strain relief design.

3. Comprehensive two dimensional CAD drawing of the panel exterior as viewed from the front and side. Must also include complete control panel interior layout showing location of panel component parts as well as full electrical schematic of control panel operation.

4. Must include manufacturer’s warranty which shall be a minimum of two years from date of installation of the pump, and controls.
B. Operating Instruction: For the pump furnished under this section, the contractor shall submit operation and maintenance manuals. At a minimum these manuals shall include:

1. General – equipment function, description, normal and limiting operating characteristics.

2. Installation instructions.

3. Operation instructions – start up procedure, normal operating conditions, and emergency and normal shutdown procedures.

4. Lubrication and maintenance instructions (if any).

5. Troubleshooting guide.

6. Suggested parts that should be held on site as spares that are non mandatory and in addition to the parts listed in section 1.02, Section E of this specification.

7. Drawings – cross sectional views, assembly and wiring diagrams.


C. Factory Performance Test Data: A qualified technician from the factory shall be provided for one day to instruct representatives of the owner and the engineer on proper operation and maintenance. With the permission of the owner, this work may be conducted in conjunction with the inspection of the installation and system start up per Section 3 of this specification. If during start up there is an equipment failure due to the pump manufacturers design or fabrication of the equipment, additional services shall be provided at no additional cost to the owner. No factory ‘representative’ shall complete the start up. The technician should be a direct employee of the manufacturer who has had first hand dealings with the equipment through its production at the factory.

D. Certifications: The contractor shall furnish the engineer with a written certification signed by the manufacturer that the equipment has been properly installed and is free from stress imposed by piping or mounting bolts. The form should indicate that all equipment has been operated without fault under load conditions and that satisfactory operation has been obtained.

1.04 MANUFACTURER’S SERVICES
A. The CONTRACTOR shall obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installation, adjustment, and testing of the equipment.

1.05 DELIVERY, STOREAGE AND HANDLING

A. Deliver a complete system to include all parts listed in submittal sent to engineer.

B. Store in a weather tight building or suitable covering to protect against damage of any nature.

C. Handle during delivery, storage and installation in a manner to prevent damage of any nature.

1.06 WARRANTY AND GUARANTEES

A. The supplier of the leachate removal system will provide all warranty services against defects in material and workmanship for a period of 24 months from the date of start up and OWNER’s final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the OWNER.

PART 2 – PRODUCTS

2.01 PUMPS

A. The contractor shall furnish and install complete leachate pumping systems for Cell 7. The leachate collection pump and leachate detection pumps shall be manufactured by Sligo Systems. The model of pump for the Cell 7 collection zone to be supplied will be a Sligo Systems Series 3-10-4 unit with a 4-inch discharge, 100 ft power lead, sufficient additional power lead to connect the breakout to the control panels located across the perimeter road and 100 ft stainless steel plastic coated lifting cable configured for sideslope riser installation. The model of pump for the Cell 7 detection zone will be a Sligo Systems Series 1-0.5-2PU with a 2-inch discharge, 100 ft power lead, sufficient additional power lead to connect the breakout to the control panels located across the perimeter road and 100 ft stainless steel plastic coated lifting cable configured for sideslope riser installation. The Stormwater Pump will be a Sligo Systems Series 3-10-4 unit with a 4-inch discharge, 100 ft power lead, sufficient additional power lead to connect the breakout to the control panels located across the perimeter road, and a lifting connection for extraction of the pump from the stormwater collection piping unit. This pump will be operated by a
float switch system. Sufficient discharge hose to reach from the piping unit to the stormwater drop inlet at the northeast area of Cell 7.

B. The submersible pumps:

1. The pumps should be capable of handling raw leachate.

2. The pumps may use a two stage impeller capable of obtaining the required flow and head. The impellers shall be fabricated from ASTM A532 93d, class 3 type A high chrome steel.

3. The pumps must be capable of running dry continuously without damaging the rotating assembly, seal bearings, or motor.

4. The pump must be capable of ingesting and passing solid matter including silt, sand, sediment, HDPE shavings as well as rock particles that may be flushed through the system periodically.

5. The pump shall include a motor cable entrance with an anti-wicking block created by a break in the power cable insulation to prevent liquid migration into the motor housing in the event that the power cable is damaged. Hermetically sealed designs are insufficient. The cable entrance shall include a rubber boot that accommodates differences in thermal expansion between the epoxy potting compound and the motor housing. A limited compression tightening plate shall be used to compress and seal this rubber boot to the motor housing. The rubber boot shall incorporate a strain relief feature that limits the cable bending radius and prevents the conductors from being damaged or cyclically fatigued.

6. The pump shall be manufactured out of cast iron with an ASTM rating of class 35, A48.

7. Dual inside mechanical seals with silicon carbide face shall be used to prevent pumped liquid from entering the motor. The seals shall be contained within an oil filled seal chamber. No contact with the pumped liquid is permitted. An oil lifter must be used to ensure that both seal faces are continuously cooled and lubricated by the oil. With the pump running dry, the seals must be capable of operating for at least one hour without damage.

8. The pump shaft shall be supported by double shielded, permanently lubricated, high temperature C3 ball bearings with a minimum B10 life of 60,000 hours. Shaft bearing designs that require lubrication via the pumped liquid are not acceptable.
9. The pumps shall be fabricated for use in a 24” SDR-11 riser pipe application and must be able to move through the HDPE pipe a distance of at least 50 feet. The pumping unit shall be enclosed in an engineered polymer skid to enable the pump to slide down the riser pipe and negotiate bends without hanging up on seams or any riser pipe imperfections. The polymer skid will use no moving parts. Wheels shall not be used as a means to send the pump down the riser pipe.

10. No built in check valve inside the pump will be permitted. Check valves shall be 304 stainless steel, dual plate, wafer style and located on the discharge hose assembly and easily accessible for maintenance. If a check valve is to be located at the pump discharge, the valve should be bored with a 3/16” bleed hole that will allow the discharge line to be emptied prior to removing the pump for maintenance.

C. Pump and motor capacity shall meet the following requirements:

<table>
<thead>
<tr>
<th></th>
<th>Cell 7 Collection</th>
<th>Cell 7 Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>3-10-4</td>
<td>1-0.5-2PU</td>
</tr>
<tr>
<td>Pumps Required</td>
<td>2*</td>
<td>2*</td>
</tr>
<tr>
<td>Operating Duty Point</td>
<td>320 gpm @ 52 ft TDH</td>
<td>51 gpm @ 17.2 ft TDH</td>
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<tr>
<td>Maximum Motor Hp</td>
<td>10</td>
<td>0.5</td>
</tr>
<tr>
<td>Voltage</td>
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<td>Frequency, Hertz</td>
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<td>60</td>
</tr>
<tr>
<td>Panel Source</td>
<td>New Panel</td>
<td>New Panel</td>
</tr>
</tbody>
</table>

* One pump shall be installed and the second pump shall be stored on site as a back-up

2.04 CONTROL PANEL

A. The new Cell 7 control panel shall be used to operate the Sligo Systems Series 3-10-4 and 1-0.5-2PU leachate pumps, and the 3-10-4 stormwater pump. The intent of the panel operation is to provide two panels constructed of 316 Stainless Steel with conduits, junction boxes, terminal boxes, also constructed of 316 Stainless Steel. All operating switches and readout devices will be installed in the exterior door to avoid excessive opening of the panels. The set point controller will be housed in a separate 12” x 10” x 8” stainless steel enclosure and the conduit connecting it to the main control panel will be provided an explosion-proof seal. The set point controller will be a Devar Inc., model 322 duplex controller. Power supplies will be RHINO encapsulated models. A Class I Division 2 model No. PS24-300D to power the level controller, floats, and...
transducers will be installed. 316 Stainless Steel junction boxes will be at the top of berm near the pump risers (see electrical drawing). Terminal strips in the junction boxes will be Allen Bradley model 1492-CA1. Each pump will be turned on when its specific on level setpoint is reached and turned off when its specific off level setpoint is reached. The control panel system will provide level control and include motor starters, breakers, overload protection devices and circuit breakers (fuses will not be used as primary protection devices). Panel will provide protection against phase loss and rapid cycle protection; phase loss detection is to be accomplished by means of a phase failure relay, and short cycle prevention is provided by a time delay relay when floats are incorporated into the system operation. The panel will include lightning protection as per panel manufacturer’s recommendation. Panel will include an intrinsically safe barrier for level sensor connection. A low voltage control circuit and power transformer shall be provided if necessary. A thermostat will be included for interior temperature control of the panel body. Power feed to the panel will be 4 wire, 230VAC, 3 phase, 60 Hz. Panel shall be UL698A listed and labeled.

B. Cell 7 Control Scheme:

1. Primary – Level sensor control as detailed above.
2. Pump failure to start to go to alarm.
3. Switches will be On, Off, or Auto
4. The control panel shall be equipped with a NEMA 4 (watertight), red and blue colored beacons on top of the panel that will flash if the pump fails to start when called on.

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Action</th>
<th>Beacon</th>
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<tr>
<td>High Sump Level</td>
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<td>Over/Under voltage</td>
<td>Stop pumps until corrected</td>
<td>Red</td>
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<tr>
<td>Loss of phase</td>
<td>Stop pumps until corrected</td>
<td>Red</td>
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<tr>
<td>Motor amp draw over</td>
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<tr>
<td>maintenance limit</td>
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<td>Blue</td>
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</table>

2.05 **SUBMERSIBLE LEVEL SENSOR**

A. Submersible level sensor lead shall be a minimum of 75’ long. Additional length will be required to tie breakout box at the top of berm to the control panel.

B. The transducer shall provide a 4-20Ma signal corresponding with 0-138” of liquid level above the sensor face.
C. The transducer shall control the pump based upon control levels as directed by the engineer. The pumps shall be activated at the ON setpoint and continue to run until the OFF setpoint is reached.

2.06 ELECTROMAG FLOW METER

A. The flow meter shall be capable of handling raw leachate and be a Sligo Systems Model 8705 flow tube with an integral mount 8732E transmitter as manufactured by Rosemount-Emerson Process Management or approved equal. Flow tube and hardware to be constructed of stainless steel.

B. Be designed to fit a 3” discharge line for the primary and a 2” inch discharge line for the secondary. Connection to flowmeter shall be achieved via a 150lb ANSI flanged configuration.

C. Be capable of operation with a minimum of 2 times pipe diameter upstream and no straight pipe limitations downstream of the meter to achieve maximum accuracy.

D. Utilize a electromagnetic design to measure and record flow rates and volumetric total. Flowmeters that utilize moving parts (such as paddlewheel or turbine style) to measure and record flow rates will not be acceptable.

E. Have an accuracy of ± .25% full scale.

F. Operate off 24VDC, and be capable of transmitting a 4-20mA flow signal, a pulsed totalizer signal and incorporate a full HART protocol data and diagnostics capability.

G. Incorporate a 2-line 16 character backlit display with through-the-glass buttons (or equivalent) to allow set up and programming while the unit remains sealed. Display shall be lockable to prevent non-authorized users from making changes.

H. Incorporate diagnostic feature for fault alarms.

I. Be capable of detecting ‘empty pipe’, forward or reverse flow and net totalization.

J. Allow user defined presets for damping and low-flow cutoff.

2.07 PUMP RETRIEVAL CABLE
A. Retrieval cable should be a minimum of 3/8” diameter and made of stainless steel.

B. Cable shall be attached to the top of the Sligo Systems pump in a secure manner as to facilitate its removal from the riser pipe assembly.

2.08 BREAKOUT BOXES

A. CONTRACTOR to supply five (5) separate 316 stainless steel electrical breakout/junction boxes with the following performance, design and construction criteria:

B. Breakout/Junction Boxes shall:

1. Be incorporated into the power, flowmeter, and level/pressure transducer cabling system to ensure that no gas migration occurs from the sump into the control panel.

2. Meet NEMA 4X standards.

3. Have a hinged front door and pad-lockable quick release latches to facilitate easy access. Screws to secure the front of the breakout box will not be acceptable.

4. All exposed fittings and fixtures will be stainless steel.

5. Electrical terminal connections inside the box must be DIN rail mounted. Multiple terminal strips will not be acceptable. Each terminal must be able to be separated from the rest without the need to replace the complete connector strip.

6. All conduit connections between the breakout boxes to the main control panel must be completely ‘sealed off’ with an epoxy based potting compound to prevent gas migration into the control panel.

PART 3 – EXECUTION

3.01 PUMP INSTALLATION

A. Pumping equipment and appurtenances shall be installed in the position indicated and in accordance with the manufacturer's written instructions. All appurtenances required for a complete and operating pumping system shall be provided, including but not limited to such items as piping, conduit, valves, wall sleeves, wall pipes, concrete foundations, anchors, grouting, pumps, starters, power supply, and controls.
3.02 FIELD TESTING AND ADJUSTING EQUIPMENT

A. Field supervisor: The manufacturer will furnish a suitably qualified technician to inspect the completed installation, make necessary adjustments and instruct operating personnel in the proper care and operation of the equipment, prior to the final acceptance of the pumping station. No distributor, representative or agent acting on behalf of the manufacturer shall be approved to complete start up services. This task must be reviewed and completed by a direct employee of the manufacturer.

B. Field Test: When the pumping facility is complete and ready for operation, then the station shall be inspected and tested for compliance to the contract documents. Test of equipment shall be made by the contractor in the presence of the engineer, electrical sub contractor, equipment manufacturer and the owner. The equipment tests shall include, but will not be limited to the following:

1. Pumps and motors: Pumps shall be run dry to ensure their run dry compatibility as well as being run in the sump under 'wet' conditions. A determination shall be made of the pumping capacity. Performance of the pumps shall meet the specified criteria when field tested.

2. Electrical: Readings shall be made of the voltage and amperage draw and recorded on the manufacturers start up form. This form should be kept by the manufacturer, Engineer, Contractor and Owner for future reference.

3. Controls: Control primary elements shall be tested to determine satisfactory performance for starting and stopping at the proper liquid levels. Pump sequence and alarm functions will also be tested.

4. Equipment: Equipment shall be operated to determine that the pump is located in the correct position in the riser assembly. A check will be conducted to ensure that there is no overloading of the pump or any overheating in any of the controls. A check will be conducted for any abnormal vibration that may be evident in the discharge plumbing. Pump will be raised and reset to ensure correct placement in riser pipe.

5. Inspection: An inspection of all mechanical and electrical equipment, controls, piping, valves, fittings, brackets, mountings, seals, conduit, painting and component features shall be made while the station is being tested to determine performance and compliance with design requirements and the specification.
6. **Structure:** The station shall be inspected for performance, structural soundness and water tightness.

7. **Repairs, adjustments and replacement:** The contractor shall make any and all necessary repairs, adjustments and replace any component parts until performance has been demonstrated to the satisfaction of the engineer. The contractor shall bear the cost of any repair, adjustment and replacement.

8. **Pump and Controls manufacturer must submit to the engineer for review a full synopsis outlining occasions where the pump assembly has been:**
   
i. Run dry without damage.
   
ii. Operated under conditions whereby solids at least 3/8” have been passed through the pump assembly without degrading the pump performance or damaging the pump or motor assembly.

The pumps, control panel, flow meters and break out boxes shall be supplied by one manufacturer.
Table 11300

EQUIPMENT WARRANTY AND CERTIFICATION FORM

Project: New Hanover County Secure Landfill

Project No.: ____________________

The undersigned hereby attests that he has examined all the referenced project drawings and specifications and hereby warrants and certifies that the equipment, component, or system he proposes to furnish and deliver meets or exceeds the contract specification, is suitable for its intended purpose and installation, and will provide satisfactory performance at the design criteria specified. This warranty shall be in addition to and not in lieu of all other warranties, express and implied.

Equipment: ____________________________

Manufacturer: ____________________________

Address: ____________________________

By: ____________________________

Type Name and Title: ____________________________

(Seal)

(Signature/Date)

Equipment Warranty and Certification must be signed by a Principal Person (President, Vice-President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier, than a Principal Person of the Supplier must also sign this form.

By: ____________________________

(Seal)

(Signature/Date)
DIVISION 16

ELECTRICAL
Specification

For

General Conditions

Specification Number: 16000
Project Name: Cell 7 Control Panel
Project Location: New Hanover County Landfill
SECTION 16000
GENERAL CONDITIONS

PART 1.0 GENERAL

1.1 DIVISION 16 DEFINITIONS

A. "Specifications" and "drawings" as used in Division 16 Specifications and on the Electrical drawings refer to the Electrical Specifications and the Electrical drawings. Reference to Specifications and drawings other than Electrical will be specifically noted as being "Mechanical Specifications", Mechanical drawings", etc.

B. "Engineer" as used in the Specifications or on the drawings refers to the engineer responsible for the design and specification documents.

C. "Contractor" as used in the specification or on the drawings refer to the Electrical Contractor. Portions of the work which are to be furnished or installed by Contractors other than the Electrical Contractor will be specifically noted as being "by Mechanical Contractor", etc.

D. All directives such as "provide", "install", "perform", "test", etc., are addressed solely to the Contractor, whether or not the word "Contractor" is specifically mentioned. Work included for others will be specifically identified.

E. Wherever in these Specifications or on the Electrical drawings the words "as directed", "as required", "as permitted", or words of like effect are used, it shall be understood that the direction, requirement, or permission of the Engineer is intended.

1.2 SCOPE

A. Contractor shall provide all services as defined by the Specifications, the drawings and in the Contract Scope of Work.

1.3 QUALITY ASSURANCE

A. All Codes and Standards referenced to be the latest published edition, unless otherwise noted.

B. Any conflicts between design documents and various Codes and Standards are to be referred to the Engineer for resolution.

C. Codes:

2. All State and Local Codes and Ordinances.

D. Standards:

The Specifications and Standards of the following organizations are by reference made a part of these Specifications.

1. Institute of Electrical and Electronic Engineers (IEEE).
5. Insulated Cable Engineers Association (ICEA).
10. Underwriters’ Laboratories, Inc. (UL).
12. Factory Mutual System (FMS).

E. Regulatory Agencies:

1. Occupational Safety and Health Administration (OSHA).

1.4 INTERPRETATIONS

A. In cases where there are differences between what is called for on the drawings and interpretations of governing Codes and Standards, it shall be the Contractor’s responsibility to ensure that the installation is made according to the governing Codes and Standards and that the Engineer is made cognizant of the situation.

1.5 INTERFERENCES

A. The drawings are generally of a diagrammatic nature. Except where dimensioned locations are shown, the Contractor shall plan and coordinate the work to eliminate interferences with other trades.
1.6 SUBSTITUTIONS

A. Manufacturer's catalog numbers noted in the Specifications and on the drawings establish the Quality level of the equipment and materials and are not intended to limit competition. Substitutions are permitted provided that the substituted equipment is of the same level of quality as the originally specified equipment. The Engineer shall have final authority as to acceptability of substitutes.

1.7 SPECIFICATIONS

A. See Attachment "A" to this Specification for a listing of specifications that apply to this Project.

PART 2.0 PRODUCTS

2.1 CONTRACTOR SUBMITTALS

A. Throughout Division 16 are requirements for various reports, confirmations and drawings which the Contractor is required to submit to the Engineer for review.

2.2 ELECTRICAL MATERIALS

A. Electrical materials shall be new and shall be listed by the Underwriters Laboratories Inc., wherever Standards have been established by that agency. In lieu of the UL listing, consideration will be given to certified test reports of an adequately equipped, recognized, independent testing laboratory competent to perform such testing, indicating conformance to all requirements of the applicable UL standard.

B. When materials or equipment must conform to the Standards of organizations such as ANSI, NEMA, and UL, proof of such conformance shall be submitted to the Engineer for approval. Unless specifically exempted in the Construction Services Contract Document, equipment listed solely by IEC is not acceptable. If an organization uses a label or listing as proof of conformance, this will be acceptable evidence, unless otherwise specified in the individual specifications. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization which is competent to perform acceptable tests and must be approved by the Engineer.

2.3 CATALOGED PRODUCTS

A. Materials and equipment shall be the cataloged products of manufacturers regularly engaged in the production of such materials or
equipment and shall be the manufacturer's latest standard design that complies with the specification requirements. When two or more units of the same type, class and size of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer. Each major component of equipment shall have the manufacturer's name, address, and the model and serial number of a nameplate securely affixed in a conspicuous location; the nameplate of the distributing agent is not acceptable.

PART 3.0 EXECUTION

Not Used.

END OF SECTION
ATTACHMENT "A"

Division 16 Specifications that apply to this Project

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Type</th>
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</thead>
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<tr>
<td>16000</td>
<td>General Conditions</td>
<td>Installation</td>
</tr>
<tr>
<td>16050</td>
<td>General Electrical Installation</td>
<td>Installation</td>
</tr>
<tr>
<td>16111</td>
<td>Electrical Raceways</td>
<td>Installation</td>
</tr>
<tr>
<td>16120</td>
<td>Low Voltage Wire and Cable</td>
<td>Materials</td>
</tr>
<tr>
<td>16140</td>
<td>Electrical Apparatus and Equipment</td>
<td>Materials &amp; Equipment</td>
</tr>
<tr>
<td>16411</td>
<td>Underground Electrical Services</td>
<td>Installation</td>
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<tr>
<td>16450</td>
<td>Grounding</td>
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Specification

For

General Electrical Installation

Specification Number: 16050

Project Name: Cell 7 Control Panel

Project Location: New Hanover County Landfill
SECTION 16050
GENERAL ELECTRICAL INSTALLATION

PART 1.0 GENERAL

1.1 WORK INCLUDED
A. Refer to Section 16000 for Scope of Work.

1.2 APPLICABLE CODES AND STANDARDS
A. Refer to Section 16000 for applicable codes and standards.

1.3 SPECIAL SYSTEMS
A. Not Required

1.4 SPECIAL CATEGORIES OF INSTALLATION
A. Refer to specific sections for details on special categories of electrical installations as follows:
   1. Underground Electrical Services Section 16411
   2. Grounding Section 16450

PART 2.0 EQUIPMENT

2.1 GENERAL ELECTRICAL APPARATUS, EQUIPMENT, AND MATERIAL
A. Refer to Section 16140 for general Electrical Apparatus and Equipment

2.2 MOTORS
A. Motors are purchased under a separate contract. Not Required.

2.3 VARIABLE SPEED DRIVES
A. Not Required

2.4 PANELS - RELAY, ALARM, AND OPERATOR CONTROL
A. Unless otherwise noted on the drawings, equipment list, or within this Specification, the Pump Manufacturer will furnish for installation by the Contractor the control panel, wiring, setting, adjusting, checking, and placing in satisfactory operation service.
B. Furnished Complete for External Cabling:

Panel will be furnished complete with pushbuttons, instruments, alarms, signals, switches, relays, and other control devices completely internally wired to terminal blocks for external cabling connections. Modification of equipment and wiring is required by the Contractor.

2.5 PUSHBUTTONS, SELECTOR SWITCHES, AND CONTROL STATION DEVICES

A. Contractor Furnished:

1. The Contractor shall furnish and install all pushbuttons, selector switches, and similar control station devices required unless otherwise noted on drawings.

2. Manufacturers:

The control devices shall have the electrical characteristics, contact configurations, type, modifications, and pilot lights as indicated on the elementary diagrams and other drawings. Control stations (field mounted) shall normally be Allen-Bradley heavy duty 800H and 800H NEMA 7. Panel mounted switches and devices used on field panels, 800H NEMA 7.

3. Enclosures:

Where required, special switches shall be of the types specified on the drawings. NEMA 4X watertight enclosures shall be normally provided for all outdoor locations. Other enclosures shall be suitable for the environment and shall be as specified on the drawings. PVC conduit shall be required in certain areas as delineated on the drawings.

4. Colors and Pilot Lights:

Stop buttons shall be colored red. Start buttons shall be black as indicated. Pilot lights shall normally be 120 volt, incandescent, transformer type press-to-test type, with 6.3 volt lamps. Lenses shall be non-faceted and colored as indicated on the elementary diagrams and drawings.

5. Nameplates:

All devices shall be provided with nameplates describing the proper function or each unit or position and also with engraved giving equipment name and number.
2.6 MISCELLANEOUS CONTROL DEVICES

A. Miscellaneous control devices such as limit switches, pressure switches, level switches, float switches, trip valves, solenoid valves, louver and damper controls, relays, timers, and similar equipment shall be furnished and installed under this Contract.

B. Furnished With Equipment:

Devices that are furnished with main equipment shall be marked (normally) by special symbol "FWE" (Furnished With Equipment).

C. Contractor Responsibility:

Miscellaneous electrical control devices mounted in pipes, tanks, ducts, or furnished with equipment shall be wired, connected, adjusted, properly set, checked out, and placed in operating service by the Contractor. The Contractor shall also be responsible for mounting, identifying wiring, connecting, adjusting, setting, checking, and placing into satisfactory service as defined in the construction services contract document, all miscellaneous control devices.

2.7 ERECTION OF EQUIPMENT

A. General

1. Manufacturer's Installation Instructions:

Where furnished or called for by the manufacturer's representative, equipment manufacturer's installation instructions shall be considered a part of the Specification and fully complied with. These instructions shall be strictly adhered to for the installation of switchgear, substations, medium voltage cables, motor control centers, panels, and similar equipment.

B. Motors:

1. Motors shipped separately from driven equipment shall be set by the Electrical Contractor, coupled, and aligned by the Mechanical Contractor. Manufacturer's instructions shall be used to determine assignment of responsibility concerning equipment furnished with motors pre-mounted or mounted on an equipment skid

C. Mounting Heights:

Individual safety switches, pushbuttons, and other devices shall normally be installed at the following mounting heights unless dictated otherwise by
State or Local Codes:  (All heights given are to bottom of device above grade, unless otherwise noted).

1. Safety Switches:  6 feet - 0 inches (to top)
2. Pushbuttons:   4 feet - 0 inches
3. Manual Starters:  4 feet - 6 inches
4. Manual pull stations:  4 feet - 0 inches
5. Receptacles:   1 feet - 6 inches

D. Mounting:

1. Equipment, control devices, and junction boxes shall be supported independent of conduit connections. Panels or cabinets shall not be mounted directly in contact with structure. Control devices and metal enclosures shall be bolted to steel channel (Unistrut) in a manner appropriate for the environment (See Typical Details).

2. All electrical equipment and devices such as miscellaneous switches, floats, photoelectric devices, and similar electrical devices will be located and set as shown on details or drawings.

2.8 GENERAL WIRING METHODS

A. Separation of Usage:

Motor and control wiring shall be routed in conduits, or other raceways as shown on the drawings. Power and control wiring shall not be routed in a common raceway except where shown on the drawings.

B. Pulling:

Where mechanical assistance is used for pulling conductors, Ideal No. 77 or equal may be used for 600 volt insulated conductors. Cable jacket and pulling compound compatibility is to be verified prior to pulling cable.

C. Splices and Terminations:

1. Lighting Conductors:

Conductors shall be continuous between boxes and condulets. No splices between boxes or condulets is permitted. Splices from fixtures to circuit conductors shall be made with wire nuts and 2-half-lap layers of Scotch 33 Brand insulating tape applied over the joints.
2. Control Conductors:

Where control conductors (as directed by the drawings) are tapped (i.e., where more than two conductor join), connections shall be made on terminal blocks. No taps shall be joined and tapped making them inaccessible for verification. Control conductors shall not be tapped other than in equipment and panels unless the drawings specify junction terminal boxes at other location. No control conductors shall be spliced in any manner. All control conductor terminations shall be made on terminal blocks only, including shields and routed point to point.

3. Power Conductors:

   a) Conductors shall be continuous from outlet to outlet. No power cable shall be spliced except on explicit instructions by the Owner's Representative.

   b) Splices, where approved, and terminations of cable operating in excess of 1000 volts, shall be made in accordance with the cable manufacturer's instructions.

   c) Connections to motors shall be made using T&B one hole compression lugs on both motor terminal and feeder conductor bolted together and covered with Raychem heat shrink or 3M Corp. cold-shrink splicing boots.

D. Lugs:

   1. All lugs shall be furnished and installed by the Contractor.

   2. Lugs for control wiring shall be T&B "Sta-Kon" nylon or vinyl insulated locking fork-tongue or ring-tongue lugs.

   3. Lugs for copper power wiring, sizes No. 12 and No. 10 AWG shall be T&B "Sta-Kon" uninsulated ring type lugs. Lugs for copper power wiring from size No. 8 AWG to size No. 1/0 AWG shall be T&B one-hole type 54100 series (600V).

   4. Where 600V motor leads are furnished without lugs, T&B 54100 series lugs shall be added.

   5. No mechanical type lugs shall be used. If any mechanical type lugs are furnished with equipment, the Contractor shall replace them with the proper compression type lugs.

E. Taping:
1. All voids, sharp corners, and bolt projections shall be made smooth by filling with Okonite or Scotch Fill before applying the laps of tape required for insulation.

2. Joints and other sections of wiring requiring tape shall be half-lapped and at least two layers. Taping shall be neatly done and shall form a permanent insulation equal in mechanical and electrical strength to the insulation of conductor. Taping shall be as follows:

   a) 600V Insulation: A minimum of 3 half-lapped layer of Okonite Low Voltage rubber insulating tape or 3M rubber tape and 2 half-lapped layers of 3M No. 33 or Okonite No. 35 jacketing tape.

   b) All taping, splicing, and termination materials shall be furnished by the Contractor.

2.9 IDENTIFICATION

A. All instrument and apparatus control cable individual wires shall have permanent, discrete identifiers (color or numbers) in addition to wiring identification numbers as shown on typical wiring diagrams to allow for easy identification and tracing. Wire identification numbers shall be placed on each end of the conductor involved by sign heat shrink marker tags. Raychem Co. Type TMS or equal. Wire numbers shall be as shown on the Elementary drawings.

B. Phase Identification:

Phase sequence throughout the installation shall be standardized in all power wiring (reference Section 16120 for phase sequence color coding).

C. Device Identification:

1. Control and power devices shall be plainly and permanently identified using the same identification as shown on the Elementary Diagram or Power Plan. Identification shall be shown on a plate mounted on the device. Control station components shall be identified by function.

2. Exception: Where the size or location of the devices make individual identification impractical, such as electronic assemblies, group identification shall be used.

3. Motors:
All motors shall be tagged by the Contractor with a permanent brass tag giving the motor number and driven equipment name per the equipment list. This tagging shall be submitted to the Owner for review.

4. Instrumentation:

All instrumentation including, but not limited to, flow switches, pressure switches, limit switches, solenoid valves, timers, level switches, transmitters, and analyzers shall be tagged by the Contractor with a permanent embossed brass or aluminum tag in accordance with the Flow Diagrams giving the instrument number.

5. Nameplates:

a) The Contractor shall provide and install, on indoor equipment, an engraved laminated phenolic nameplate, black letters on white background for safety switches, contactors, motor controllers, individual circuit breakers, control devices, junction terminal boxes, and any other equipment used to control, switch, or disconnect electrical circuits. The nameplate engraving shall be in accordance with data provided on the drawings.

b) The Contractor shall provide brass engraved nameplates for all field mounted pushbutton stations and disconnect switches as shown on details. The Contractor shall provide the same engraving of the name and equipment number on the field mounted pushbutton stations and disconnect switches as the name and equipment number on the starter in the Motor Control Center or as directed by the Owner's Representative. A complete listing shall be forwarded to Owner for approval.
Specification

For

Electrical Raceways

Specification Number: 16111

Project Name: Cell 7 Control Panel

Project Location: New Hanover County Landfill
PART 1.0 GENERAL

1.1 WORK INCLUDED

A. Equipment Furnished.

The Electrical Contractor shall furnish and install the following equipment as required:

1. 316 Stainless Steel Conduit
2. Rigid PVC conduit.
3. Liquid-tight flexible metal conduit.
4. Conduit fittings, including explosion proof.

1.2 CODES AND STANDARDS

A. For applicable Codes and Standards, refer to Section 16000.

1.3 SUBMITTALS

A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings and conduit bodies.

PART 2.0 EQUIPMENT

2.1 CONDUIT

A. Rigid 316 Stainless Steel Conduit

1. Conduit shall be made of 316 stainless steel inside and outside, and shall conform in all respects to the American National Standards Institute (ANSI) Rigid Steel Conduit Specification, Underwriter's Laboratories (UL) specifications, and the National Electrical Code (NEC), Article 344.
2. Each piece of conduit shall be straight, free from blisters and other defects, cut square and taper reamed, and furnished with coupling in 10-foot lengths threaded on each end.

3. Coupling shall be applied to one end of each length of conduit and color-coded plastic thread protectors to the other end.

4. Rigid steel conduit may be used in all areas except where prohibited by the NEC or noted otherwise on the drawings.

B. Rigid PVC Conduit

1. PVC conduit shall be heavy wall Schedule 40 and rated for service at 90 degrees C. Tubing shall be of PolyVinylChloride produced from high impact unplasticized PVC compound having non-combustible, non-magnetic, non-corrosive, and chemical resistant properties. Conduit shall conform in all respects to Federal Specification WC-1094 and NEC Article 347.

2. Conduit shall be furnished in 20-foot lengths with one coupling applied to each length. Each length shall be marked with the manufacturer's name, trademark, type of material, and whether it is recognized for use above or below ground (sunlight resistant).

3. Rigid PVC conduit may be installed in applications below grade, where shown on the drawings or in the specifications. Where it is installed under load-bearing driveways, roads, or parking lots it shall be concrete encased.

4. Elbows from below grade up to equipment to be 316 stainless steel PVC adapters.

C. Liquid-Tight Flexible Metal Conduit

1. Liquid-tight flexible metal conduit shall be fabricated from a aluminum tape which is spirally wrapped into an interlocked assembly and is covered with an outer liquid-tight, non-metallic, sunlight-resistant PVC jacket and is available in standard conduit trade sizes. Liquid-Tight flexible metal conduit shall comply with NEC Article 351.

2. Liquid-tight flex shall be used where necessary to allow for movement or to localize vibration. Its use shall be limited to trade sizes 1/2 inch through 4 inches, no longer than 3 feet in length.

3. All connections to distribution transformers shall be made using liquid-tight flex a minimum of 18 inches in length.
2.2 CONDUIT FITTINGS

A. Rigid Steel Conduit Fittings

1. All conduit fittings used must be of the same material as the conduit with cast covers and neoprene gaskets unless otherwise specified on the drawings. Condulets are to be of the threaded type, Crouse-Hinds or equal. Mogul series condulets are required on 1-1/4 inch conduit and larger.

2. Conduits shall terminate in threaded hubs. T&B 370 series bullet hubs may be used where required except in Class I, Division I areas.

3. Where required to facilitate conduit installation, a malleable iron "Erickson" coupling may be used.

4. Threadless or set-screw couplings are prohibited.

5. In hazardous areas, conduit fittings shall be of the type approved for the hazardous area of classification.

B. Liquid-Tight Flexible Metal Conduit Fittings.

Connectors for liquid-tight flex shall be of aluminium or stainless steel with a nylon insulated throat. Connectors shall firmly grip the metal flex as well as the PVC jacket and shall be furnished with a sealing O-ring where entering the enclosure. Fittings shall be T&B Super-Tite through 1-1/4 inch, and T&B Liquid Tight external grounding type 1-1/2 inch and larger.

2.3 RACEWAY SUPPORTS

A. Conduit Straps

1. Conduit straps for individually run conduits shall be stainless steel.

2. For structural steel support, use Kindorf type RC conduit clamps.

3. For flat wall, use of the following is permitted:

   a) Two-hole pipe straps or one-hole pipe straps with wall spacers. Attach to wall with fasteners appropriate for the composition of the attachment surface. Expansion anchors to be used in concrete masonry walls. Plastic expansion and toggle anchors are not permitted.
b) Conduit secured to channel (Unistrut P1000 or P1001) with pipe straps, drilled channel secured to wall with expansion anchors, flat washers and spring nuts.

c) Conduit support devices specifically manufactured for the permanent support of electrical raceway. Strap iron and other materials not specifically designed for this purpose will not be permitted.

4. J-clamp type pipe supports are not permitted.

B. Channel Support Systems

Where multiple conduits are run together, and for other electrical equipment supports, standard structural channels shall be used (Unistrut, Kindorf, B-Line or equal).

C. Support configurations as shown on the typical details and drawings.

2.4 CONDUIT INSTALLATION

A. Motor Terminations.

Conduits shall terminate at motors in liquid-tight flexible conduit. Electrical Contractor shall provide reducers or drill and tap larger where required to facilitate installation.

B. Conduit Rack Installation.

1. For multiple runs of conduit, racks or supports must be provided and constructed of sufficient strength to ensure secure support. They must be of designs shown on typical details, or as detailed on the drawings, or as approved by the Contractor.

2. Conduit routing and racking is not shown on the plan drawings. The Electrical Contractor shall group and route conduit to avoid interferences with other trade’s installations. Conduit shall not be routed other than parallel or perpendicular to walls to allow for appearance of good workmanship.

3. The Electrical Contractor shall size and locate pull boxes per all applicable codes and to allow for ease of installation and maintenance.

C. Support Spacing

1. Conduit support spacing shall be in accordance with Articles 346 through 351 of the National Electrical Code.
D. Plugging.

1. Any unused openings in raceway, fittings, boxes, etc., shall be plugged with T&B series 121 metallic bushing and series 815 steel pennies or other equivalent means.

E. Raceway Integrity

1. Conduit and other raceway shall be installed in a manner that will prohibit the entrance of water, moisture, or any other contaminants at all equipment or devices. Satisfactory and adequate methods of installation, materials, sealing, breathing, drainage, and physical aspects of installation shall be used to ensure the proper, minimum maintenance installation.

2. Seals and Drains

   a) Where conduits pass from areas of high humidity to cooler ambients, they must be sealed with Crouse-Hinds type EYS or EZS, or Appleton sealing condulets with suitable drain fittings. Conduits must also be sealed in hazardous areas as required per NEC Article 500.

   b) Vertical loops in conduit should be avoided if possible, but when they are necessary, the conduit must be drained with ECD drain installed in proper condulet.

F. PVC Conduit Installation

1. PVC conduit system shall be installed in strict accordance with the manufacturer’s instructions and recommendations. The installation will be rigidly inspected for damage. Damage noted will be repaired by the Electrical Contractor in strict accordance with the manufacturer’s recommendations.

G. Minimum Size

1. Minimum size conduit shall be:

   a) Stainless steel 1/2 inch.

   b) Liquid-tight flexible conduit.

   c) PVC conduit - 1 inch.

   d) Below grade - 1 inch, regardless of material.
2. Size restriction does not apply to vendor furnished conduits or any raceway furnished with equipment or fixtures, except as noted on the drawings.

H. Bends
1. Changes of direction in conduit runs shall preferably be made in manufactured elbows. Where conduit must be bent, bending shall be done using a hand bender or hickey, or a hydraulic bender. Bends shall be carefully made so as not to cause any kinks, flattening of the conduit, or any changes to the internal conduit area. One-shot bending is not permitted on 4 inch and larger conduit.

2. Conduit runs shall not have more than four 90 degree bends or equivalent of 360 degrees of bends between pull points.

I. Joints.
1. Electrical Contractor shall square cut all conduit ends, ream and file to remove burrs before installation, and shall properly clean and cap all empty conduits.

2. Running threads shall not be used on conduit for connection at joints and couplings.

J. Installation
1. Conduits shall not be run alongside or within 1 foot of steam, hot fluid, or gas lines.

2. Installation of raceway shall be complete including end caps, box covers and condulet covers. Raceway shall be cleaned with a swab or duct cleaner, then proved with a mandrel prior to pulling cables.

K. Typical Details.
1. See "Typical Details" on drawings for additional application requirements.

L. Conduit Wrap
1. Concrete Slabs
   a) All conduits entering or exiting from concrete slabs or pads, or elbows used to connect to PVC conduit underground shall be hot-dipped rigid galvanized steel. Conduit passing
through the slab shall be given two heavy coats of coal tar enamel (Bitumastic). Conduit underneath concrete slabs may be PVC, not required to be concrete encased.

2. Below Grade
   a) All conduits exiting from below grade in outside areas subject to atmospheric conditions shall be encased in concrete to a point approximately 6 inches above grade. Where PVC conduit is used below grade, adapters to stainless steel shall be used for exiting above grade, outside of enclosures. The adapters shall be installed in the horizontal portion prior to the turn-up.

2.5 CABLE TRAYS
   Not Required.

2.6 UNDERGROUND INSTALLATIONS
   A. Underground conduit shall be PVC Schedule 40 heavy wall conduit. Concrete encasement shall be as specified on the drawings or as required by this specification. Conduit installed under and within 4'-0" of roadways and other load-bearing surfaces shall be rigid steel galvanized approved for direct burial or concrete encased PVC.
   B. Underground conduit shall have a minimum of two Brady Company yellow safety tapes marked "CAUTION - BURIED ELECTRICAL LINE" above them, one 6 inches above their to surface, and one 12 inches above their to surface. On duct banks 3 feet wide and larger, one strip is to be laced on each side 6 inches above the duct bank and should be repeated 12 inches above the duct bank. On duct banks less than 3 feet wide, one strip of the warning tape should be laced in the center of the duct bank 6 inches above the concrete and another 12 inches above the concrete.
   C. For further underground installation criteria, see Section 16411.

PART 3.0 EXECUTION
   Not used.

END OF SECTION
Specification

For

Low Voltage Wire and Cable

Specification Number: 16120
Project Name: Cell 7 Control Panel
Project Location: New Hanover County Landfill
SECTION 16120
LOW VOLTAGE WIRE AND CABLE

PART 1.0 GENERAL

1.1 WORK INCLUDED

A. This specification covers the requirements for all low voltage wire and cable to be used in the installation of the electrical systems for this project. The systems include power, lighting, control, and instrumentation systems. This specification does not include requirements of special systems cable or plenum cable. Guidance for special systems appears in the specific system specification.

B. All wire and cable shall be furnished and installed by the Contractor, except where furnished by others as indicated on the conduit and cable schedule or the plan drawings.

C. Abbreviations

1. ANSI American National Standards Institute.
2. EPR Ethylene-Propylene Rubber.
3. IEEE Institute of Electrical and Electronic Engineers, Inc.
4. ICEA Insulated Cable Engineers Associations
5. ISA Instrument Society of America.
6. NEC National Electrical Code.
7. NEMA National Electrical Manufacturer’s Association.
8. PVC Poly Vinyl Chloride.
9. UL Underwriter’s Laboratories.

1.2 GENERAL REQUIREMENTS

A. All wire and cable shall be UL listed. In addition to other standard labeling, all wire and cable shall be marked “UL” on the outer surface indicating UL certification.

B. All insulated wire and cable shall conform to the minimum requirements of the ICEA standards for cable installed in wet locations, with the cable being subjected to all degrees of moisture conditions. Wire and cable
shall comply with the applicable requirements of the NEC (latest edition) in regards to cable construction and usage.

C. The conductors of wires and cables shall be of copper and have conductivity in accordance with the standardization rules of the IEEE. The conductor and each strand shall be round and free of kinks and defects.

D. Conductors of insulated wires and cables shall be stranded in accordance with the ICEA Class “B” or “C”. Single conductor sizes No. 12 AWG through No. 10 AWG used for lighting and receptacle circuits shall be solid, non-stranded.

E. Grounding conductors, when insulated, shall be colored solid green. Conductors intended as a neutral shall be colored solid white or gray.

1.3 SUBMITTALS

A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Product Data: Provide manufacturer’s catalog information showing dimensions, ratings, colors, and configurations.

PART 2 PRODUCTS

2.1 MULTICONDUCTOR POWER CABLE

A. 600 volt multi-conductor power cable shall be type TC, suitable for cable tray installation and approved for direct burial. Rated for 90 degrees C operation in wet or dry locations without deterioration. It shall be made of single copper conductor type rated XHHW-2 (EPR or XLPE). The conductors are to be cabled together with copper ground wires in the interstices, suitable fillers, tape and a flame retardant sunlight and weather resistant overall PVC or Hypalon jacket. The cable shall pass the IEEE-383 flame test.

B. Ground wire size shall meet NEC Article 250 requirements.

C. Phase color coding for three conductor cable shall be accomplished using integrally colored cable insulation or colored tape at the cable terminations, as follows:

<table>
<thead>
<tr>
<th>240/120VAC Color Code:</th>
<th>PHASE A</th>
<th>PHASE B</th>
<th>PHASE C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Red</td>
<td>Blue</td>
<td></td>
</tr>
</tbody>
</table>

PHASE A

PHASE B

PHASE C
2.2 SINGLE CONDUCTOR LIGHTING, POWER, AND CONTROL WIRING

A. 600 volt single conductor power and control wiring shall be type XHHW-2 rated for 90 degrees C operation in wet or dry locations without deterioration. It shall be made of single copper conductor with EPR or XLPE insulation. The cable shall pass the IEEE-383 flame test.

B. 600 volt single conductor lighting wire shall be type THHN/THWN thermoplastic insulated stranded copper wire with a nylon jacket rated to withstand conductor temperature of not less than 75 degrees C without deterioration. Wiring terminating inside of fixture enclosures or ballast housings shall be rated not less than 90 degrees C.

C. For single conductor lighting, power, and control conductors that originate on molded case circuit breaker terminals or other device terminals rated at less than 75 degrees C, insulation must by type TW thermoplastic over stranded copper wire rated to withstand conductor temperature of 60 degrees C, wet or dry. Transition to THHN/THWN insulated conductors for lighting or XHHW insulated conductors for power is permissible downstream of the home run conduit.

2.3 MULTI-CONDUCTOR CONTROL CABLE

A. Multi-conductor control cable shall be NEC Type TC for tray installation and approved for direct burial, No. 14 AWG through No. 10 AWG, 7 or 19 strand copper with XLPE insulation. Individual conductors, 600V Type XHHW, are to be cabled together with the necessary tape and fillers. The cable shall pass the IEEE-383 flame test.

B. Individual conductors to be UL listed and color coded in accordance with Table 1 “Control Cable Color Code and Sequence”.

C. Base colors shall be obtained by integrally colored insulation compound.

2.4 SHIELDED INSTRUMENT CABLE

A. Flame retardant shielded cable shall be stranded copper, individually insulated with flame retardant PVC, conductor size as indicated on the conduit and cable schedule, but no smaller than No. 18 AWG. The cable shall be 300V PLTC, UL approved for tray installation and direct burial in accordance with NEC Article 318. The insulated conductors shall be twisted into pairs or triples if specified and each pair or triple shielded with an aluminum Mylar 100% shield with a tinned copper drain wire, cable tape, and a flame retardant PVC jacket. Where multi-pair or multi-triples are required, the individual shielded pairs or triples shall be cabled together with an overall aluminum Mylar 100% shield with a copper drain wire.
B. Color code of each pair shall be black and red. Where triples are required, colors shall be black, red, and blue. Each pair of triples within a multi-pair cable shall be numbered.

2.5 THERMOCOUPLE CABLE

A. Not required.

2.6 PORTABLE CORDS

A. Portable cords shall be UL type “SO” or “STO” 600 volt cord with green grounding conductor.

PART 3.0 EXECUTION

Not Used.

END OF SECTION

TABLE 1 FOLLOWS
# TABLE 1

## CONTROL CABLE COLOR CODE AND SEQUENCE

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<thead>
<tr>
<th>CONDUCTOR NUMBER</th>
<th>BACKGROUND OR BASE COLOR</th>
<th>FIRST TRACER COLOR OR HASH MARK</th>
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</table>
Specification

For

Electrical Apparatus and Equipment

Specification Number: 16140

Project Name: Cell 7 Control Panel

Project Location: New Hanover County Landfill
PART 1.0 GENERAL

1.1 WORK INCLUDED

A. The Contractor shall furnish and install all equipment and apparatus listed in this specification except where the items are specifically referred to as Owner furnished or furnished by others. In which case, the Contractor shall install the referenced item. For all other general provisions, refer to Section 16000.

1.2 SUBMITTALS

A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Product Data: Provide ratings and enclosure dimensions for safety switches. Submit catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details for magnetic motor starters. Provide data sheets showing electrical characteristics including time-current curves for fuses.

PART 2.0 PRODUCTS

2.1 EQUIPMENT

A. Individual Magnetic Motor Starters

   1. General

      a) Individual magnetic motor starters shall not be smaller than NEMA Size 1. Enclosures for outdoors shall be NEMA 4X. The Contractor shall add to, and/or modify, any wiring or equipment to match the elementary diagrams, or as otherwise designated on the drawings.

   2. Overload Protective Devices

      a) Motor controllers and starters shall have overload protective devices in each ungrounded phase and shall be the thermal, inverse time type. A manual reset-type pushbutton shall be provided on the outside of the controller housing.
3. **Type**

   a) Starters and controllers shall be of the type designated on the drawings such as:

   (1) Full voltage non-reversing (FVNR).

   b) Starters and controllers shall normally be of the combination type to provide an individual disconnect means and short-circuit protection by means of a magnetic only motor circuit protector (MCP) or thermal-magnetic circuit breaker.

   c) Covers shall be interlocked with the operating handle of the switch so that the cover cannot be opened unless the switch is in the OFF position. The interlock shall be "defeatable" by authorized personnel. The operating handle shall be suitable for padlocking in the OFF position with not less than 2 padlocks.

   d) Dead-front type construction shall be used on the combination units.

4. **Control Power**

   a) Unless otherwise designated, controls shall be 120 volts. Starters shall be equipped with individual control power transformers with secondary fuse and grounded.

5. **Auxiliary Contacts**

   a) Auxiliary contacts shall be added as required by the elementary diagrams if existing equipment does not have adequate spare contacts.

B. **Overload Heaters**

   1. **Number**

      a) Three overload heaters shall be provided in all three-phase motor controls and one in 120 volt single-phase motor controls.

   2. **Sizing**

      a) Overload heaters shall be sized according to the motor full load currents and NEC Article 430.

C. **Circuit Breakers**
1. Owner or Contractor Furnished
   
a) Normally, circuit breakers shall be included as a part of any equipment designated to be furnished by others. Otherwise, the Contractor will furnish and install all breakers designated on the drawings or equipment list that are not indicated as being furnished by others.

2. Breakers shall be of the type, rating, number of poles, sizes, and interrupting capacity specified or required for the environment, location, application and load served.

3. Molded Case Circuit Breakers
   
a) Molded case circuit breakers shall be circuit interrupting devices which will operate both manually for normal switching functions and automatically under overload and short circuit conditions. Circuit breakers shall provide circuit and self-protection when applied within rating.

   b) The operating and switching mechanism shall be entirely trip-free so that the contacts cannot be held closed against an abnormal overcurrent or short circuit condition. The switching mechanism shall be quick-make, quick-break type.

   c) The operating handle of the circuit breaker shall open and close all poles of a multi-pole breaker simultaneously.

   d) Each circuit breaker shall have a trip unit to provide overload and short circuit protection. The trip unit for each pole shall have elements providing inverse time delay under overload conditions and instantaneous magnetic tripping for short circuit protection. The trip element shall operate a common trip bar which shall operate all poles in case of an overload or short circuit through any one pole. Automatic tripping shall be clearly indicated by handle position.

   e) Conductor terminations shall be rated 75 degrees C minimum.

4. Individually Mounted Enclosure
   
a) Individually mounted circuit breakers shall be mounted in enclosures specified as suitable for the location and the environment.

   b) Outdoor enclosures shall be NEMA 4X.
5. Applications

a) For the applications listed, molded case circuit breakers shall be rated as follows:

<table>
<thead>
<tr>
<th>SERVICE VOLTAGE</th>
<th>AMPERE RANGE</th>
<th>USAGE</th>
<th>INTERRUPTING CAPACITY (RMS SYM. AMPERES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/240</td>
<td>15-125</td>
<td>Lighting or Service Panels</td>
<td>22,000</td>
</tr>
</tbody>
</table>

A. Safety Switches

1. Configuration

a) The switches shall be of the type, voltage, ampere and horsepower rating, number of poles, fusible or non-fusible, as specified or required for the environment, location, application and load being served.

2. Type

a) All safety switches shall be 316 stainless steel NEMA 4X premium heavy-duty, horsepower rated, industrial type, Square-D Class 3110 or equal. All switches shall be UL listed.

b) Fusible switches shall be complete with fuses of the type and rating as indicated on the drawings or in the specifications.

c) All switches shall have switch blades that are fully visible in the OFF position when the door is open and shall be of dead front construction, with arc suppressers.

d) The mechanism shall be quick-make, quick-break type.

e) The door shall be the defeatable interlock type with the handle or mechanism to prevent unauthorized opening of the door in the ON position.

f) Padlocking provisions shall be provided for padlocking in the OFF position with one or more locks or lockable hasps.

g) Grouped switches in a common enclosure shall be mounted in enclosure types specified elsewhere.
h) Outdoor enclosures shall be 316 stainless steel NEMA 4X.

i) All switches shall be provided with an engraved laminated phenolic nameplate showing the power source (unit number or other), and title and equipment served. Nameplates to be black letters on a white background indoors, stainless steel outdoors.

B. Fuses

1. Manufacturer and Listing

a) Dual-element, time-lag fuses shall normally be used unless otherwise specified or shown on the drawings. Fuses shall be as follows:

   (1) Bussman Manufacturing Division of McGraw Edison Company, Fusetron Class K5.

      (a) 240 VAC-type FRN-R

      (b) 600 VAC-type FRS-R

   (2) Gould-Shawmut, Trionic class K5

      (a) 240 volt-type TR-R

      (b) 600 volt-type TRS-R

2. Listing

a) Near completion of the work, the Contractor shall confirm that the proper fuses are installed in each fusible device, and shall furnish to the Owner a complete listing of fuses. The list shall indicate the number, class, size and type fuse and the equipment number, horsepower, and descriptive title of the equipment protected. Where Contractor purchased fuses are not properly sized, the Contractor shall replace them with properly sized fuses. At the end of the project, the Contractor shall turn over to the Owner all remaining Contractor furnished fuses. One spare set of each type and size of fuse installed shall also be furnished.

C. Boxes

1. Outdoor applications shall be NEMA type 4X.
2. Special installations such as corrosive or hazardous classified areas will be as shown on the drawings.

3. All boxes shall be furnished with appropriate covers and shall be accessible for maintenance purposes.

4. Surface mounted boxes installed exposed shall be threaded, cast alloy iron or malleable iron. Iron type shall have zinc electroplate, or galvanized finish with appropriate lacquer.

5. Boxes shall be of the approved type for the devices served and shall be made of a material and finish compatible with the conduit system and location.

6. Splice and Tap Boxes
   a) Splice and tap boxes for power circuits shall be used only where designated on the drawings and shall be of the type and sizes indicated. On lighting and convenience receptacle circuitry, wiring may be spliced and boxes shall be provided for concealed or surface mounting as previously specified or may be JIC oiltight of size and type indicated on the drawings or minimum size as specified in the NEC.

7. Pull Boxes
   a) Pull boxes for outdoor exposed wiring shall be provided as required to facilitate the installation of the wiring.
   b) Pull boxes shall be accessible for maintenance use.
   c) For conduit sizes 3/4, 1 and 1-1/2 inch, conduit fittings of the "C", "LB", "T" and similar types may be used for cable pulling.
   d) Where pull boxes are required, each power circuit shall have a separate galvanized steel threaded hub type box with a gasketed cover installed.
   e) For exterior, exposed work pull boxes shall be threaded hub type with gasketed cover and of equivalent lengths as shown in table above.

8. Junction and Terminal Boxes
   a) Junction and terminal boxes for control circuits shall be installed where shown on the drawings or as required to facilitate the installation.
b) In terminal boxes, all control wiring shall be terminated on identified terminal blocks or terminal points. Splicing and joints are not permitted except where specifically called for on the design documents.

c) Knockout type boxes are not permitted. All boxes shall be individually punched or with hubs as determined by the conduit routings.

d) Terminals inside terminal boxes shall be numbered to match the wire numbers as shown on the elementary diagrams (if shown) or other drawings. Wire numbers shall be placed on the terminal box subpanel using labels with the numbers typed on the labels in non-smear ink.

e) Terminal blocks in terminal boxes shall be Allen Bradley 1492-CA1, channel mounted, medium duty, tubular clamp type or equal. Not more than two conductors per terminal shall be allowed. Switch-action fused terminal blocks shall be Allen Bradley 1492-CE9 or equal.

9. Sizing

a) All junction and terminal boxes shall be sized and configured by the Contractor unless otherwise indicated on the drawings. Boxes shall not be smaller than the sizes as required by the NEC or as indicated on the drawings.

END OF SECTION
Specification

For

Underground Electrical Services

Specification Number: 16411

Project Name: Cell 7 Control Panel

Project Location: New Hanover County Landfill
SECTION 16411
UNDERGROUND ELECTRICAL SERVICE

PART 1.0 GENERAL

1.1 WORK INCLUDED

A. Underground electrical conduits and conduit duct banks.

1.2 QUALITY ASSURANCE

A. All codes and standards are understood to be the latest editions, unless otherwise noted.

B. Comply with the following minimum requirements:

1. NEMA TC-2 Schedule 40 Polyvinyl Chloride Conduit.

2. UL Underwriter’s Laboratories Labeling or Listing.

C. Standard of Quality.

D. Throughout the specification, types of materials may be specified by manufacturer's name and catalog number in order to establish standards of quality and performance and not for the purpose of limiting competition. Unless specifically stated otherwise, the Contractor may assume the phrase "or other approved" is inferred, except that it is the Contractor's responsibility to prove equality with specified items. If the Contractor elects to prove such equality, he must request the Owner's Representative's approval in writing prior to substituting such items for the specified item.

PART 2.0 PRODUCT

2.1 MATERIALS

A. Underground Duct Bank - Concrete Encased.

1. Plastic Conduit:

   Rigid PVC conduit per NEMA Standard TC-2, Designation EPC-40-PVC for Type II application, direct burial and encase in concrete. Standard lengths with tapered end and matching solvent-weld type couplings. The following list constitutes the only approved manufacturers for the conduit.

   a) Carlon.
b) Olin.

c) Orangeburg Standard.

d) Triangle.

e) Other approved.

B. Miscellaneous hardware.

1. Drag Wire:

   Continuous type, nylon coated steel drag wire.

C. Cast-In-Place Concrete and Components:

Conform to the following general requirements.

1. Provide concrete work per ACI 301-72 (Rev. 81) and ASTM C94, and related reference ACI and ASTM Standards.

2. Provide normal weight, 3,000 psi air-entrained concrete at 28 days.

3. Provide cement, ASTM C150, Type II for moderate sulfate resistant, standard strength (28-day) concrete.

4. Provide fine and coarse aggregates, per referenced standards, 1-inch maximum size.

5. Utilize air-entrained admixture to produce air-entrained concrete. Submit manufacturer and type of approval.

6. Mix red inorganic pigment (iron oxide) in cement, at rate of 5 pounds per 100 pounds Portland Cement, or paint the top of the duct bank concrete red.

7. For reinforcing steel, use deformed bars per ASTM A615, Grade 60. Utilize metal or plastic chairs or spacers to support reinforcing. Do not use brick, block, tile, wood or similar material. Provide "sand plates" or resteel chair legs where chairs are supported on earth or granular fill.

D. Grounding:

Provide grounding in accordance with NEC Article 250, mandatory rules and as indicated on the drawings. Also reference Section 16450 of these Specifications.

PART 3.0 EXECUTION
3.1 TRENCH EXCAVATION

A. Comply with the following OSHA requirements, Sub-Part P.
   1. 1926.650; General Protection Requirements.
   2. 1926.651; Specific Excavation Requirements.
   3. 1926.652; General Trenching Requirements.
   4. 1926.653; Definitions.

B. Excavate by an approved method to permit installation of the duct bank along the grades shown on the drawings.

C. Excavate a trench of sufficient width to allow thorough compacting of the backfill under and around the duct bank.

D. Where excavation is in rock, remove all rock to a depth below the grade shown on the drawings. Rock excavation shall be classified or paid for on a unit price basis. Rock is defined as material that cannot be ripped or excavated by a backhoe with a one cubic yard bucket with rock teeth.

E. The Owner's approval is required for the extent of trench excavation, prior to the duct bank installation, for planning purposes.

F. Provide all necessary bracing and bridging to maintain traffic flow during construction, through all the areas interrupted by trenching.

G. Provide all necessary repair to erosion control measures and redeeding of the areas distributed by trenching.

H. Sheet and brace the excavation, as required, to prevent caving. The trench width may be increased accordingly. Maintain sheeting until the duct bank has been inspected and backfilled to a depth of two feet over the top of the duct bank. Leave sheeting and shoring in place, where directed by the Owner's Representative.

I. Provide all pumping necessary for de-watering the trenches and the existing manhole to provide proper work conditions for installation of the duct bank and appurtenances.

3.2 DUCT BANK INSTALLATION.

A. Provide Schedule 40, PVC conduit in one complete lot. Partial shipment will not be permitted.
B. Carefully handle and place all conduit to prevent breakage or other damage. Brace and support all conduit, as shown on the drawings, to prevent shifting, when concrete is poured.

C. Lay the conduit in a true straight line or a gradual and uniform sweep, unless otherwise shown on the drawings. Maintain a uniform grade, as required, between the building and existing manhole.

D. Clean out the conduits as the laying progresses and securely plug all open ends to prevent water, mud and debris from entering the duct.

E. Upon completion of work, ensure that no obstructions exist in any conduit, by pulling an approved mandrel through each conduit, witnessed by the Owner's Representative.

F. Form single conduit, as specified, into duct banks, as shown on the drawings, using molded plastic spacers, as indicated.

G. Stagger joints 6 inches vertically and horizontally in horizontal duct runs and make the joints water-tight. Where it is necessary to cut a tapered end on duct, make the cut with a tool or lathe designed to cut a taper to match the taper of the particular duct used.

H. Provide PVC/rigid steel conduit adapters, where the duct enters an existing manhole or other termination point, complete with rigid steel end bells, as required.

I. Identify the duct bank with a minimum of two Brady Company yellow safety tapes marked: "CAUTION - BURIED HIGH VOLTAGE ELECTRICAL LINE", one 6 inches below top surface and one 6 inches below final grade.

J. Leave a nylon coated steel drag wire in each empty conduit for pulling purposes.

3.3 TRENCH BACKFILLING

A. Immediately after the duct bank or conduit has been installed and the concrete cured, backfill the trench in level layers. Tamp and compact each layer, before the next layer is deposited.

B. Backfill the trench, using fine material up to 18 inches above top of the duct bank, placed in 6 inch layers and thoroughly tamped. Place balance of the backfill with the aid of dump trucks, bulldozers, crane, or other approved methods. Thoroughly compact the backfill.
C. For conduit or duct banks under paved roads or streets, consolidate the backfill in such a manner as to provide an unyielding foundation of the paving. Remove all excess materials.

D. Succeeding layers of backfill above 18 inches may contain coarser materials. Ensure that the backfill material is free from brush or any other perishable or objectionable matter that would prevent proper consolidation, or that might cause subsequent settlement. Compact the backfill thoroughly by tamping or other method approved by the Owner's Representative. Maintain compaction at a minimum of 95 percent of the maximum density at optimum moisture content, as determined by ASTM D-698-70 Standard Proctor. The Owner's Representative will direct which method of consolidation to be followed on each part of the work.

E. Do not use rock or boulders in the backfill for at least two feet above the top of the duct bank. Do not use stone larger than 6 inches in its greatest dimension, in backfilling.

F. Ensure that the surface of the backfill is safe for vehicular traffic as soon as possible. Provide an approved moist material, thoroughly compacted by the tamping in thin layers (about 4 inches each), at the upper 12 inches of the backfill. Lay the top layer at the required surface grade.

G. Assume full responsibility of any deficiency in quantity of material and filling depressions caused by settlement of backfilling.

H. Dispose of all material from construction as directed by the Owner's Representative.

END OF SECTION
Specification

For

Grounding

Specification Number: 16450
Project Name: Cell 7 Control Panel
Project Location: New Hanover County Landfill
SECTION 16450
GROUNDING

PART 1.0 GENERAL

1.1 SCOPE
A. This specification covers the minimum requirements for materials, configuration, and installation of the supplemental grounding system required for this project. Grounding specifically for the purpose of lightning protection is not included.

1.2 CODES AND STANDARDS
A. Applicable Codes and Regulations.

1. General
Refer to Section 16000 for general codes and standards.

2. IEEE Institute of Electrical and Electronics Engineers

3. NEC National Electrical Code

4. OSHA Occupational Safety and Health Act.

5. ANSI American National Standards Institute

6. ICEA Insulated Cable Engineers Association.

7. ASTM American Society for Testing and Materials

8. NEMA National Electrical Manufacturer's Association

9. FM Factory Mutual System Standards.


11. UL Underwriter's Laboratory

1.3 SUBMITTALS
A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Product Data: Provide for grounding electrodes and connections.
2.0 PRODUCT

2.1 GENERAL

A. Grounding System

The grounding system shall include grounding and bonding conductors for protection of the new pump installation.

B. Verification

The existing grounding installation shall be verified by the Contractor by ground resistance measurement to present an electrical impedance to ground of less than 5 ohms. This testing shall be documented and presented to the Owner’s Representative prior to the installation of the Cell 7 leachate pumping system.

C. Remedial Work

If the existing ground tests at greater than 5 ohms impedance, an additional 3/4” X 10’ copper clad ground rod shall be installed at minimum 10’ spacing from the existing ground rod, interconnected with No. 2/0 AWG bare copper cable. Ground rods and interconnecting cables shall be added until a tested impedance of less than 5 ohms is measured and documented. The addition of chemicals or artificial watering of the soil is not permitted.

2.2 SPECIFIC COMPONENT REQUIREMENTS

A. Ground Rods

Where specified on the drawings, grounding connections to earth shall be made with 3/4” diameter (minimum) copper-clad steel extendible type ground rods a minimum of 10 feet long or length as indicated on the drawings or typical details.

B. Conductors

Buried conductors shall be No. 2/0 AWG, soft-drawn, stranded bare copper.

C. Connections
1. Buried

Buried grounding system connections shall be made using (in order of preference) crimp-on compression connectors or the exothermic welding process. Typical connections are cable-to-cable splices, X's and tees, and cable-to-ground rod. Connector crimps or welds to be made per manufacturer's instructions.

2. Exposed

Unless specifically indicated on the drawings or typical details, exposed grounding system connections shall be made using (in order of preference) crimp-on compression connectors, the exothermic welding process or by silicon-bronze mechanical connectors. These connectors shall be compatible with, approved for, and listed for use with all materials involved.

3. Acceptable Manufacturers

Ground system connections shall be made with material by the following Vendors:

a) Erico/Cadweld
b) Burndy Corporation
c) Thomas & Betts
d) Square-D/Anderson Electric
e) Other approved

PART 3.0 EXECUTION

3.1 INSTALLATION

A. General Equipment

1. In general, cases, mounting frames, etc. of all switches, circuit breakers, control panels, motors, equipment skids and any other electrically operated or electrical equipment, conduit and other raceways shall be effectively and permanently grounded with a separate copper grounding conductor of cross-section as required by the National Electrical Code and the drawings. It shall be of sufficient capacity to insure continuity and continued effectiveness of the ground connections to carry fault currents. Ground
conductors must be as short and straight as possible, protected from mechanical injury and if practical without splice or joint. The grounding conductor shall be run from a ground established at the source of supply to the equipment to be grounded. Ground wires from below grade shall be protected as shown on the drawings. All grounding conductors shall be copper.

2. A copper grounding conductor must be run inside the conduit or raceway enclosing the power conductors supplying the equipment. Conductor size will be indicated on the drawings.

3. Surge Arrestors

The ground terminals of surge arrestors shall be connected to the frame of the protected equipment by a direct metallic path.

3.2 METALLIC RACEWAYS

A. Conduit

All metallic conduits and wiring channels must be connected at each end to the equipment being fed.

1. Conduits and cable armor

   a) All flexible conduits, liquid-tight flexible metal conduits and other discontinuities in the electrically continuous conduit system used for power cables shall be provided with bonding jumpers.

3.3 CONDUCTORS

A. Where circuits consist of two or more power conductors in a conduit or wiring channel, the grounding conductor will be sized per NEC Article 250, but in no case smaller than No. 12 AWG, nor larger than No. 4/0. The grounding conductor shall be stranded and covered with a green jacket. Grounding conductors for control and instruments will not normally be used.

B. In all power wiring cases the white wire should be used for the current-carrying neutral only and never as a grounding conductor, or any other purposes.

C. Fuses

Fuses shall not be installed in the grounded neutral conductor throughout the installation.