

EXHIBIT B

SCS ENGINEERS, PC



PROJECT MANUAL

Cell 7 (MSW Landfill) and Phase 7
(C&D Landfill) Construction Project

Buncombe County, North Carolina



Buncombe County Solid Waste Department
81 Panther Branch Road
Alexander, North Carolina 28701

Prepared by:

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December 2021
File No. 02220306.09

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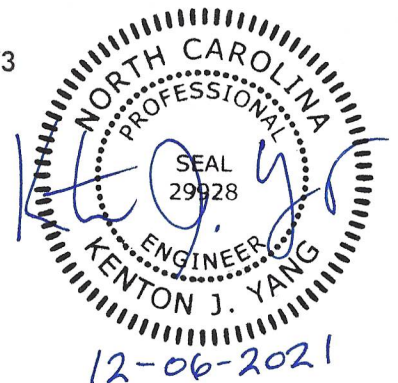
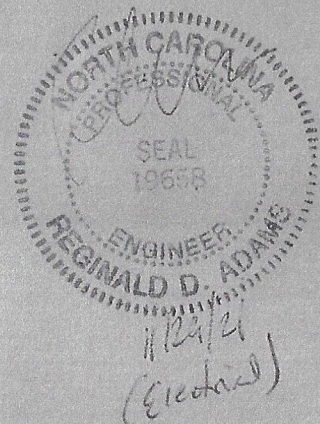


TABLE OF CONTENTS

BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL) CONSTRUCTION PROJECT BUNCOMBE COUNTY, NORTH CAROLINA

DIVISION 0 - BIDDING AND CONTRACT DOCUMENTS

00003	Table of Contents
00020	Advertisement to Bid
00100	Instructions to Bidders
00200	Information Available to Bidders
00300	Bid Form
00310	Minority Business Plan Compliance Requirements
00410	Bid Security Forms
00480	Non-Collusive Affidavit
00485	Authority to Execute Contract
00500	Agreement
00610	Performance Bond
00620	Payment Bond
00670	Notice to Proceed
00700	General Conditions
00820	Contractor's Sales Tax Report

DIVISION 1 - GENERAL REQUIREMENTS

01010	Summary of Work
01025	Measurement and Payment
01026	Schedule of Values
01027	Applications for Payment
01036	Change Order Procedures
01041	Project Coordination
01050	Field Engineering
01101	Safety, Health and Emergency Response Requirements
01200	Project Meetings
01300	Submittals
01310	Construction Schedules
01380	Construction Photography
01390	Pre-Construction Photography
01410	Testing and Testing Laboratory Services
01510	Temporary Utilities
01590	Field Office
01600	Material and Equipment
01625	Start-Up
01630	Product Options and Substitutions
01700	Contract Closeout

TABLE OF CONTENTS

BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL) CONSTRUCTION PROJECT BUNCOMBE COUNTY, NORTH CAROLINA

01710	Cleaning
01720	Project Record Documents
01730	Operating and Maintenance Data
01740	Warranties and Bonds

DIVISION 2 - SITE WORK

02100	Site Preparation
02200	Excavation, Backfill, and Compaction
02271	Fabric Cushion
02272	Filter Fabric
02273	Woven Monofilament Fabric
02276	Erosion and Sedimentation Control
02277	Geosynthetic Clay Liner (GCL)
02278	Compacted Soil Liner
02279	Stormwater Tarp
02505	Crushed Stone Paving
02576	Asphalt Paving
02605	Precast Concrete Structures
02612	Reinforced Concrete Pipe
02623	High Density Polyethylene (HDPE) Pipe
02640	Valves and Appurtenances
02700	Protective Cover Aggregate
02776	High Density Polyethylene (HDPE) Liner
02901	Miscellaneous Work and Cleanup
02985	Seeding and Mulching

DIVISION 11 - EQUIPMENT

11323	Submersible Riser Pumps
-------	-------------------------

DIVISION 26 - ELECTRICAL

260500	Common Work Results for Electrical
260519	Low-Voltage Electrical Power Conductors and Cables
260526	Grounding and Bonding for Electrical Systems
260529	Hangers and Supports for Electrical Systems
260533	Raceway and Boxes for Electrical Systems
260553	Identification for Electrical Systems
262416	Panelboards

TABLE OF CONTENTS

BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL) CONSTRUCTION PROJECT BUNCOMBE COUNTY, NORTH CAROLINA

262816	Enclosed Switches and Circuit Breakers
264313	Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits

END OF SECTION 00003

DIVISION 0

BIDDING AND CONTRACT DOCUMENTS

SECTION 00020

ADVERTISEMENT FOR BIDS

BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY
CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL)
CONSTRUCTION PROJECT
BUNCOMBE COUNTY, NORTH CAROLINA

Bid Due Date: January 20, 2022 at 3:00 PM

The project generally consists of the following at the existing Buncombe County Solid Waste Management Facility:

1. Cell 7 – Construction of a ±13.5-acre Subtitle D Landfill expansion complete with a composite bottom liner system, a leachate collection system, and appurtenances, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, seeding and mulching, storm drainage, and perimeter access road construction.
2. Phase 7 – Construction of a ±5.5-acre C&D Landfill expansion, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, landfill soil base, seeding and mulching, storm drainage, and access road construction.

The work shall be substantially completed in accordance with the General Conditions within 270 calendar days from (and including) the date when the Notice to Proceed is issued. All work shall be complete and ready for final payment in accordance with the General Conditions within 300 calendar days from (and including) the date when the Notice-to-Proceed is issued.

The Buncombe County Solid Waste Management Facility is located approximately nine miles north of the City of Asheville. The landfill is located at 81 Panther Branch Road, Alexander, North Carolina 28701. Ms. Kristy Smith may be contacted at Kristy.Smith@buncombecounty.org to arrange site visits.

Complete drawings and specifications may be reviewed online free of charge at www.planscope.com. Complete hard copy sets of drawings and specifications may be obtained at bidder's expense from Accent Imaging, Inc, 8121 Brownleigh Drive Raleigh, North Carolina 27617, 919-782-3332. Complete electronic drawings and specifications (PDF) may be downloaded at bidder's expense from www.planscope.com.

A mandatory Pre-bid Conference will be held at **2:00 PM on December 15, 2021**, in the Buncombe County Solid Waste Management conference room located at 81 Panther Branch Road, Alexander, North Carolina 28701.

Buncombe County will receive bids at Buncombe County Procurement Division, 200 College Street 4th Floor, Asheville, North Carolina 28801 until **3:00 PM, local prevailing time, on January 20, 2022**. Bids received after 3:00 PM will not be accepted. The clock at Buncombe County Procurement Department shall determine the time of receipt.

If forwarded by courier, the sealed envelope containing the bid shall be marked on the exterior: Buncombe

County Solid Waste Management Facility – Cell 7 (MSW Landfill) and Phase 7 (C&D Landfill) Construction Project and with the name, address, and North Carolina Contractor License Number of the Bidder. The sealed envelope shall be addressed to Buncombe County Procurement Department, attention of Mr. Ron Venturella, 200 College Street, 4th Floor, Asheville, North Carolina 28802. Bidder shall bear the risk for late submission due to unintended or unanticipated delay. Any bid received after the bid submission deadline will be rejected.



Bidders that turn in bids on time will receive a Microsoft Teams meeting invite from the Procurement Manager, Ron Venturella. The bid opening shall be held virtually on Thursday, January 20th, 2022, at 3:30pm; at which time bids will be opened and read aloud. This is due to recent changes in County procedures for public meetings brought on by the COVID Omicron variant.

To qualify, all bids shall be submitted using bid forms contained in the Contract Documents, and submittal of all information requested in the Instructions to Bidders (00100). Incomplete or segregated bids will not be accepted.

All bidders must meet the minority business plan compliance requirements provided in Section 00310 of the project manual.

Questions regarding the intent or Scope of Work must be submitted in writing to Mr. Kenton Yang, P.E. (kyang@scsengineers.com) and, to be given consideration, must be received at least ten (10) calendar days prior to the date fixed for the opening of bids. Appropriate responses, where required, will then be issued by addendum to all plan holders prior to the date scheduled for submittal of bids.

All bids must be accompanied by a certified or cashier's check or bid bond in the amount of 5 percent of the total base bid amount made payable to Buncombe County. Said deposit shall be retained by the Owner as liquidated damages in event of failure of the successful bidder to execute the contract within fifteen calendar days after the award or to give satisfactory surety as required by law.

No bid shall be withdrawn for a period of 90 days after bid opening except as provided in Instructions to Bidders.

Bidders must be licensed contractors in the State of North Carolina.

The Owner reserves the right to waive informalities and to reject any and/or all bids

Buncombe County, North Carolina

END OF SECTION 00020

SECTION 00100

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS

Terms used in these Instructions to Bidders are defined in the Standard General Conditions of the Construction Contract (EJCDC C-700, 2018 Edition) and have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to Owner, as distinct from a sub-bidder, who submits a Bid to the Bidder. The term "Successful Bidder" means the lowest, qualified, responsible and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement for Bids, Instructions to Bidders, the Bid Form, Minority Business Plan, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids.)

2. COPIES OF BIDDING DOCUMENTS

- 2.1 Complete sets of Bidding Documents in the number and for the sum stated in the Advertisement for Bids may be obtained from the Engineer. This amount represents reproduction and administration costs and is non-refundable.
- 2.2 Complete sets of Bidding Documents must 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, by Bidders and their sub-bidders.
- 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.

3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- 3.1 It is the responsibility of each Bidder, before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may in any manner affect cost, progress, performance or furnishing of the Work, c) consider federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress, performance or finishing of the Work; (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.
- 3.2 Reference is made to Section 00200 for identification of:
 - 3.2.1 those reports of explorations and tests of subsurface conditions at the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such reports but not upon non-technical data, interpretations or opinions contained therein or for the completeness thereof for the purposes of bidding or construction.

- 3.2.2 those drawings of physical conditions in or relating to existing surface and subsurface conditions (except Underground Facilities) which are at or contiguous to the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such drawings but not upon the completeness thereof for the purposes of bidding or construction.
- 3.2.3 Copies of such reports and drawings will be made available by Engineer and Owner to any Bidder on request at the cost of reproduction. Those reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which Bidder is entitled to rely as provided in Paragraphs 4.2.1 and 4.2.2 are incorporated therein by reference. Such technical data has been identified and established in Section 00200.
- 3.3 Information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities or others, and Owner does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.
- 3.4 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Article 5 of the General Conditions.
- 3.5 Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.
- 3.6 On request in advance, Owner will provide each Bidder access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations.
- 3.7 The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.
- 3.8 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of

construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions of performance and furnishing of the Work.

4. INTERPRETATIONS AND ADDENDA

- 4.1 All questions about the meaning or intent of the Contract Documents are to be directed in writing to Engineer. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 4.2 Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer.

5. BID SECURITY

- 5.1 The Bid must be accompanied by a Bid security made payable to Owner in an amount of five percent of the Bidder's Base Bid Price and in the form of a certified or cashiers check or a Bid Bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. The Owner will only select one Bid for contract award.
- 5.2 The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required payment and performance bonds, whereupon the Bid Security will be returned. If the Successful Bidder fails to furnish the qualifications submittals or fails to execute and deliver the Agreement and furnish the required Bonds within ten (10) calendar days of the Notice of Award, Owner may annul the Notice of Award and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the ninety-first (91st) day after the Bid opening whereupon Bid Security of such Bidders will be returned. Bid Security of other Bidders will be returned approximately seven (7) days after the Bid opening.
- 5.3 The Bid Bond shall be issued by a company authorized to do business by the North Carolina Department of Insurance and having a Registered Agent in the State of North Carolina.

6. CONTRACT TIME

The number of consecutive calendar days within which the Work is to be completed (the Contract Time) is set forth in the Agreement (Section 00500).

7. LIQUIDATED DAMAGES

Provisions for liquidated damages are set forth in the form of Agreement (Section 00500).

8. SUBSTITUTE MATERIAL AND EQUIPMENT

The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the "effective date of the Agreement." The procedure for submittal of any such application and consideration by Contractor is set forth in Article 7 of the General Conditions, and as may be supplemented in the General Requirements.

9. SUBCONTRACTORS

- 9.1 If requested by the Owner, the apparent Successful Bidder, and any other Bidder so requested, shall, within seven days after the date of the request, submit to Owner an experience statement with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, person and organization. The amount of Subcontract work shall not exceed fifty percent (50%) of the Work. If Owner after due investigation has reasonable objection to any proposed Subcontractor, supplier, other person or organization, the Owner may, before giving the Notice of Award request the apparent Successful Bidder to submit an acceptable substitute without an increase in Contract Price or Contract Time. If apparent Successful Bidder declines to make any such substitution, Owner may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. Declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractor, Supplier, other person or organization listed and to whom Owner does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner subject to revocation of such acceptance after the Effective Date of the Agreement as provided in the General Conditions.
- 9.2 No contractor shall be required to employ any Subcontractor, Supplier, other person or organization against whom he has reasonable objection.
- 9.3 If the Contractor intends to subcontract any portion of the critical components, such as, excavation, backfill, compacted soil material liner, or geosynthetic material installation, the Contractor shall provide documentation that the proposed subcontractor meets all the same qualifications as stipulated for the Contractor.

10. BID FORM

- 10.1 The Bid Form is included with the Bidding Documents.
- 10.2 Bid Forms shall be completed in ink or by typewritten. All blanks on the Bid Forms must be completed. **Bids must be submitted for the base bid and all alternates. Submit one original.**
- 10.3 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant

secretary. The corporate address and state of incorporation must be shown below the signature. If requested, the person signing a Bid for a corporation or partnership must produce evidence satisfactory to the Owner of the person's authority to bind the corporation or partnership.

- 10.4 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- 10.5 All names 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 and telephone number for communications regarding the Bid must be shown.
- 10.8 All Bidders shall submit, attached to Bid, Sections 00310, 00410, 00480, and 00485 filled out in their entirety.

11. SUBMISSION OF BIDS

- 11.1 Bids shall be submitted at or before the time and at the place indicated in the Advertisement for Bids (Section 00020) and shall be submitted in an opaque sealed envelope. The envelope shall be marked on the exterior "Bid for Buncombe County Solid Waste Management Facility – Cell 7 (MSW Landfill) and Phase 7 (C&D Landfill) Construction Project" and with the name and address of the Bidder and accompanied by the Bid Security, and other required documents. No proposal will be considered unless filed on or before the time and at the place designated in the Advertisement for Bids. Proposals received after the time set for the opening will be returned unopened.

- 11.2 Proposals may be hand delivered or sent by registered carrier. The sealed proposal, marked as indicated above, should be enclosed in an additional sealed envelope similarly marked and addressed to:

Mr. Ron Venturella
Buncombe County Procurement Division
200 College St., 4th Floor
Asheville, North Carolina 28801

The envelope shall be marked with the project title and Contractor License number in the lower left corner. The words "BID ENCLOSED" shall be clearly noted on the front of the envelope. Proposals sent by mail and arriving after the time for opening shall not be considered as valid bids. In such instances, the bidder shall have no claim against the Owner.

- 11.3 More than one Bid received for the same work from an individual, firm or partnership, a Corporation or Association under the same or different names will not be considered. Reasonable grounds for believing that any Bidder is interested in more than one Bid for the same work will cause the rejection of all such Bids in which the Bidder is interested.

If there are reasonable grounds for believing that collusion exists among the Bidders, the Bids of participants in such collusion will not be considered.

- 11.4 All Bidders shall submit, as part of a complete bid package, the following Specification Sections: 00300, 00310, 00410, 00480, and 00485 filled out in their entirety. **Incomplete bid packages may be considered nonresponsive and disregarded by the Owner.**
- 11.5 Contractor shall provide a detailed construction schedule with narrative and bar chart indicating the proposed sequence of construction to meet the substantial completion date. The construction schedule should provide sufficient detail including personnel, equipment, shop drawing submittal schedule, etc. to be used as part of the bid evaluation. The Owner will make careful consideration of the construction schedule submitted with Bid Form 00300 in evaluation of all bids submitted.

12. MODIFICATION AND WITHDRAWAL OF BIDS

- 12.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the deadline for submitting Bids. A request for withdrawal or a modification must be in writing and signed by a person duly authorized to do so; and, in case signed by a deputy or subordinate, the principal's proper written authority to such deputy or subordinate must accompany the request for withdrawal or modifications. Withdrawal of a Bid will not prejudice the rights of a Bidder to submit a new Bid prior to the Bid Date and Time. After expiration of the period for receiving Bids, no Bid may be withdrawn or modified.
- 12.2 No Bidder may withdraw his bid for a period of ninety (90) days after Bids are opened.

13. OPENING OF BIDS



- 13.1 Bidders that turn in bids on time will receive a Microsoft Teams meeting invite from the Procurement Manager, Ron Venturella. The bid opening shall be held virtually on Thursday, January 20th, 2022, at 3:30pm; at which time bids will be opened and read aloud. This is due to recent changes in County procedures for public meetings brought on by the COVID Omicron variant.
- 13.2 Bid tabulation of the amount of the Base Bids will be made available after the opening of Bids.

14. BIDS TO REMAIN OPEN

- 14.1 All Bids shall remain open for ninety (90) calendar days after the day of the Bid opening, but Owner may, at its sole discretion, release any Bid and return the Bid Security prior to that date.
- 14.2 Extensions of time when Bids shall remain open beyond the ninety-day period may be made only by mutual agreement between the Owner, the Successful Bidder, and the surety, if any, for the Successful Bidder.

15. AWARD OF CONTRACT

- 15.1 To the extent permitted by applicable state and federal laws and regulations, Owner reserves the right to reject any and all Bids, to waive any and all informalities not involving price, time or changes in the Work with the Successful Bidder, and the right to disregard all nonconforming, nonresponsive, unbalanced or conditional Bids. Bids may be considered irregular and subject to rejection if they show serious omission, unauthorized alteration of form, unauthorized alternate bids, incomplete or unbalanced unit prices, or irregularities of any kind. Also, Owner reserves the right to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. Discrepancies between words and figures will be resolved in favor of words. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.
- 15.2 The Bidder shall be notified of any errors in the Bid Documents submitted to the Owner which affect his status as low bidder or as may otherwise reduce his total bid. If the corrected total represents an unacceptable amount and the Contractor can substantiate same, totally in accordance with the General Statutes of the State of North Carolina G.S. 143-129.1, the Bidder may then withdraw his bid without forfeiture of his bid security and the Owner may award the project to the second low bidder or re-let the project, in which instance the Bidder, previously allowed to withdraw, shall not be permitted to re-bid this project or subcontract any portion thereof.
- 15.3 In evaluating Bids, Owner will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 15.4 Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted following the requirements of Article 17 of the Instructions to Bidders.
- 15.5 Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- 15.6 The Owner shall have the right to determine the low Bidder on the basis of the sum of the Total Base Bid plus any combination of alternatives.
- 15.7 If the contract is to be awarded, it will be awarded to the lowest responsible, responsive Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project. However, the Owner may award the bid in accordance with any

and all procedures allowed by law, including but not limited to North Carolina G.S. 143-129.

- 15.8 The Owner reserves the right to award the Contract conditioned upon funds being made available for such construction.

16. TAXES

The Contractor shall pay all applicable sales, consumer, use and other similar taxes required by law. The Contractor is responsible for reviewing the pertinent State Statutes involving the sales tax and sales tax exemption and complying with all requirements. The Contractor shall include all Federal, State and local taxes in his bid. The Contractor shall indemnify, defend and hold harmless, Owner, Engineer and their employees, agents and representatives from and against any and all claims, damages, losses, penalties, fines and tax liabilities whatsoever resulting from Contractor's failure to include such taxes in his bid, pay any such tax or comply with any applicable tax requirements or statutes.

17. SIGNING OF AGREEMENT

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten (10) calendar days thereafter, Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds. Each counterpart is to be accompanied by a complete set of the Drawings with appropriate identification.

18. QUALIFICATIONS OF SURETY COMPANIES

In order to be acceptable to the Owner, a surety company issuing Bid Guaranty Bonds, or 100% Performance/Payment bonds, called for in these Specifications, shall meet and comply with the following minimum standards:

- a. Surety must be admitted to do business in the State of North Carolina.
- b. Surety shall have been in business and have a record of successful continuous operations for at least five (5) years.
- c. Attorneys-in-fact who sign bid bonds or performance/payment bonds must file with such bond a certified copy of their power of attorney to sign such bond.
- d. Agents of surety companies must list their name, address and telephone number on all bonds.
- e. Surety shall have at least the following minimum ratings:

<u>CONTRACT AMOUNT</u>			<u>BEST'S RATING</u>
0	to	50,000	Class III B+ or better
50,000	to	500,000	Class V A or better

500,000	to	2,500,000	Class VI A or better
2,500,000	and over		Class VII A or better

RATINGS SCHEDULE

Class III	2,000,000	to	5,000,000
Class V	10,000,000	to	25,000,000
Class VI	25,000,000	to	50,000,000
Class VII	50,000,000	to	100,000,000

- f. The life of the bonds shall extend twelve (12) months beyond the date of final payment and shall contain a waiver of alteration to the terms of the Contract, extensions of time and/or forbearance on the part of the Owner.
- g. The Performance Bond shall be in an amount equal to one hundred percent (100%) of the Contract Price conditioning that the successful bidder shall comply in all respects with the terms and conditions of his Contract, and his obligations thereunder, including the Specifications and shall indemnify and save harmless the Owner against or from all costs, expense, damages, injury or loss to which the Owner may be subjected by reason of wrong doing, misconduct, want of care of skill, negligence or default upon the part of the Contractor, his agents, or employees, in or about the execution of performance of this Contract, including said Specifications, and shall save and keep harmless the Owner against and from all claims or losses to it or from any cause whatever, including patent infringements, in the matter of the performance of said Contract, and including also any patent infringements because of designed operation methods on the project and/or the use of any patented thing, equipment, and/or apparatus installed by him herein.
- h. Whenever the Surety or sureties on the Bond so furnished shall be deemed by the Owner to be insufficient or unsatisfactory, the Contractor, within ten (10) days after notice to that effect shall furnish and deliver a new bond to the Owner in the same penalty and on the same conditions with Surety satisfactory to the Owner and this duty shall continue on the part of the Contractor, whenever and so often as the Owner shall require a new bond with a satisfactory Surety or Sureties. If the Contractor shall fail to furnish such bond, within ten (10) days after said notice is mailed to his address, the Owner through its proper agent or agents, may stop all further work under said Contract and complete the unfinished work at the expense of the Contractor.

19. REQUIRED DISCLOSURE

- 19.1 With its bid submission, bidder shall disclose all material facts pertaining to any felony conviction or any pending felony charges in the last three (3) years in this state or any other state or the United States against (i) bidder, (ii) any business entity related to or affiliated with bidder, or (iii) any present or former executive employee, officer, director, stockholder, partner or owner of bidder or of any such related or affiliated entity. This disclosure shall not apply to any person or entity which is only a stockholder, which person or entity owns 20% or less of the outstanding shares of a bidder whose stock is publicly owned and traded.

19.2 At its sole discretion the Owner may reject any bidder the Owner finds to lack, or whose present or former executive employees, officers, directors, stockholders, partners or owners are found by the Owner to lack honesty, integrity, or moral responsibility. The discretion of the Owner may be exercised based on the disclosure required herein. By submitting a bid, bidder recognizes and accepts that the Owner may reject the bid based upon the exercise of its sole discretion and bidder waives any claim it might have for damages or other relief resulting from the rejection of its bid based on these grounds.

20. NONDISCRIMINATION IN EMPLOYMENT

During the performance of this contract the Contractor agrees as follows:

The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to race, color, religions, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising, layoff or termination; rate of pay or other forms of compensation and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notice to be provided by the Local Public Agency setting forth the provisions of this nondiscrimination clause.

The Contractor will note that signing the Proposal in the Contract document constitutes certification of nondiscrimination. However, all certifications called for herein shall be executed prior to the award of contract, when applicable.

Buncombe County shall have final authority to determine the question of compliance with these specifications.

21. COLLUSIVE BIDDING

In accordance with Section 112(c) of Title 23 USC, the Contractor (Bidder), by submission and execution of this bid, certifies that he has not entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with his bid on this project.

Before executing any subcontract, the successful bidder shall submit the name of any proposed subcontractor for prior approval and a sworn affidavit substantially in accordance with the preceding.

22. CONTRACT DETERMINATION - DEBARMENT

A contract will not be awarded to a Contractor that has been suspended by the State of North Carolina or any agency or department thereof for conviction or indictment or any of the offenses enumerated in the General Statutes G.S. 133-27.

Subcontracts of any tier will not be awarded to a subcontractor (or firm) that has been suspended for conviction or indictment of any of the offenses enumerated in G.S. 133-27.

23. CONTRACTOR'S LICENSING

The Bidder's (Contractor's) attention is called to the fact that the requirements of Chapter 87 of the General Statutes of the State of North Carolina and Regulations of the North Carolina Licensing Boards for Contractors established and empowered by virtue of Chapter 318 of the public laws of 1925, as amended, shall be enforced on this contract, as applicable.

24. ASSIGNMENTS

The Contractor shall not assign the whole or any part of this Contract, or any monies due, or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this Contract the instrument of assignment shall contain a clause substantially to the effect that is agreed that the right of the Assignee in and to any monies due or to become due to the Contractor shall be subject to prior liens of all persons, firms, and corporations for services rendered or materials supplied, for the performance of the work called for in this Contract.

25. MUTUAL RESPONSIBILITY OF CONTRACTORS

If any other contractor, subcontractor or any of their employees, or any other persons shall sustain any loss or damage through the negligence of the Contractor in the performance of the work, the Contractor agrees to be responsible for said loss or damage. If any claim is asserted against the Owner on account of any loss or damage to other contractors, subcontractors or their employees through the negligence of the Contractor, the Owner shall notify the Contractor and the Contractor shall be responsible for said loss or damage, and the Contractor shall indemnify and hold the Owner and Engineer harmless against any such losses, damages, and claims, including the Owner's and Engineer's attorney's fees.

26. LABORERS AND MATERIALMEN'S BOND

A payment bond is required in the amount of 100% of the construction contract amount, conditioned upon the prompt payment for all labor or materials for which a contractor or subcontractor is liable. The payment bond shall be solely for the protection of the persons furnishing materials or performing labor for which a contractor or subcontractor is liable.

27. DISPUTE RESOLUTION

The Agreement to be entered into between Buncombe County and the successful Bidder for the Work to be performed included in this Instructions to Bidders shall be governed by the laws of the State of North Carolina and any disputes arising thereunder shall not be subject to arbitration. Should any claim or dispute arise between the Parties concerning any such Agreement or this Bid that cannot be resolved amicably, then any action to enforce or interpret the terms of the same shall be brought in the General Court of Justice of Buncombe County, North Carolina, which shall have venue and jurisdiction over the subject matter and the Parties. All rights and remedies of Owner under this Contract shall be cumulative and none shall exclude any other rights or remedies allowed by law or by equity. The Parties shall agree that this paragraph establishes exclusive and sole venue and jurisdiction for any legal proceeding in Buncombe County, North Carolina.

END OF SECTION 00100

SECTION 00200

INFORMATION AVAILABLE TO BIDDERS

The Engineer has relied upon the following reports. Interested Bidders may request PDFs of this reports for general information purposes only.

Name of Reports:

Buncombe County Solid Waste Management Facility, Permit to Construct Application – Phase IV (Cell 7), Part 2: Engineering Plan, Appendix 3B: Design Geotechnical Evaluation, CDM Smith, April 2014.

Buncombe County, Test Pits for Cell 7 Soils, BLE, September 2012 and June 2021.

Buncombe County Solid Waste Management Facility, Permit to Construct Application – C&D Landfill Phase 7, Part 3: Engineering Plan, Appendix D: Geotechnical Evaluation, SCS Engineers, PC, March 2021.

END OF SECTION 00200

SECTION 00300

BID FORM

PROJECT IDENTIFICATION:

**BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY
CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL)
CONSTRUCTION PROJECT
BUNCOMBE COUNTY, NORTH CAROLINA**

THIS BID IS SUBMITTED TO:

Mr. Ron Venturella
Buncombe County Procurement Division
200 College Street, 4th Floor
Asheville, North Carolina 28801

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid Form and the Agreement, and in accordance with the other terms and conditions of the Contract Documents.
2. Only approved pre-qualified bidders are allowed to bid on this project.
3. Bidder accepts all of the terms and conditions of the Bidding Documents, including without limitation those dealing with the disposition of Bid Security. This bid will remain open for ninety (90) days after the date of the bid opening. If awarded a contract, Bidder agrees to execute the Agreement and comply with all of the conditions stipulated in the Notice of Award within the time stipulated in the Notice of Award.
4. In submitting this Bid, Bidder makes all representations required by the Instructions to Bidders and further warrants and represents that:

- (a) Bidder has examined copies of all the Bidding Documents, the Advertisement for Bids, and of the following Addenda (receipt of which is hereby acknowledged):

No. <u>1</u>	Date <u>12/23/2021</u>
No. <u>2</u>	Date <u>1/7/2022</u>
No. <u>3</u>	Date <u>1/14/2022</u>
No. <u>4</u>	Date <u>1/12/2022</u>

- (b) Bidder has examined the site and locality where the Work is to be performed, the legal requirements (federal, state and local laws, ordinances, rules and regulations) and the conditions affecting cost, progress, or performance of the Work and has made such independent investigations as Bidder deems necessary.
- (c) Bidder has obtained and carefully studied all reports and drawings of subsurface conditions and drawings of physical conditions which are identified in Section 00200

of the Bidding and Contract Requirements and accepts the determination set forth in Article 4 of the General Conditions thereto of the extent of the technical data contained in such reports and drawings upon which Bidder is entitled to rely.

- (d) Bidder has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, and studies (in addition to or to supplement these referred to in (c) above) which pertain to the subsurface or physical conditions at the site or which otherwise may affect the cost, progress, performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Article 5 of the General Conditions and the Supplementary Conditions thereto.
 - (e) Bidder has reviewed and checked all information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities.
 - (f) Bidder has correlated the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents.
 - (g) Bidder has given the Engineer written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
 - (h) By bidding in response to this invitation, the Bidder represents that in the preparation and submission of this Bid, said Bidder did not, either directly or indirectly, enter into any combination or arrangement with any person, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free, competitive Bidding in violation of the Sherman Act (15 U.S.C. Section 1).
5. Bidder agrees to complete the Work for the following prices. The Bid Form must be complete in ink or by typewritten. Amounts shall be shown in both words and figures. In case of discrepancy, the amount in words will govern.
- (a) Except as otherwise provided in this Bid Form, the Bidder represents to Owner that all prices herein include all Federal, State and Local taxes. The Bidder agrees to assume responsibility for the payment of all such taxes and shall indemnify and hold harmless the Owner from all tax liability arising out of or related to Bidder's breach of this representation or failure to pay such taxes.
 - (b) Bidder understands that the Owner may select a Bidder based on the lowest responsible, responsive bids received. The Owner reserves the right to reject any or all Bids and to waive any informalities in the Bidding procedure.

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START OF PHASE 7 (C&D LANDFILL) BID FORM						
Item	Item Description	Units	Scheduled Quantity	Unit Price		Total Amount (In Figures)
				(In Figures)	(In Words)	
1	Clearing and Grubbing	AC	9.5	\$ 9,000.00	NINE THOUSAND DOLLARS	\$ 85,500.00
2	Removal of Vegetation and Topsoil	AC	9.5	\$ 5,900.00	FIVE THOUSAND NINE HUNDRED DOLLARS	\$ 56,050.00
3	Excavate, Haul, and Stockpile of Soil Material in Borrow Area	CY	50,400	\$ 7.00	SEVEN DOLLARS	\$ 352,800.00
4	Excavate, Haul and Backfill of Soil Material in Phase 7 Expansion Area	CY	12,600	\$ 5.00	FIVE DOLLARS	\$ 63,000.00
5	Excavate Rippable Rock	CY	1,200	\$ 15.00	FIFTEEN DOLLARS	\$ 18,000.00
6	Excavate Non-Rippable Rock	CY	300	\$ 75.00	SEVENTY-FIVE DOLLARS	\$ 22,500.00
7	Undercut and Stockpile Unsuitable Materials and Backfill Undercut Area with Suitable Soils	CY	6,000	\$ 8.00	EIGHT DOLLARS	\$ 48,000.00
8	Furnish and Install French Drain	LF	1,200	\$ 80.00	EIGHTY DOLLARS	\$ 96,000.00
9	Furnish and Install 24-Inch Crushed Stone Perimeter Access Roadway	SY	6,800	\$ 40.00	FORTY DOLLARS	\$ 272,000.00
10	Furnish and Install Guardrail	LF	1,700	\$ 42.00	FORTY-TWO DOLLARS	\$ 71,400.00
11	Furnish and Install Sediment and Erosion Control	LS	1	\$ 600,000.00	SIX HUNDRED THOUSAND DOLLARS	\$ 600,000.00
12	Furnish and Install Permanent Seeding and Mulching	SY	31,600	\$ 0.50	ZERO DOLLARS AND FIFTY CENTS	\$ 15,800.00

END OF PHASE 7 (C&D LANDFILL) BID FORM

PIPING

28	Furnish and Install 10-inch Perforated HDPE Leachate Collection Pipe	LF	2,600	\$ 80.00	EIGHTY DOLLARS	\$ 208,000.00
29	Furnish and Install 10-inch Solid HDPE Leachate Collection Pipe	LF	700	\$ 25.00	TWENTY-FIVE DOLLARS	\$ 17,500.00
30	Furnish and Install 18-inch Solid HDPE Leachate Collection Pipe	LF	100	\$ 100.00	ONE HUNDRED DOLLARS	\$ 10,000.00
31	Furnish and Install 24-inch Perforated HDPE Leachate Collection Pipe	LF	400	\$ 250.00	TWO HUNDRED FIFTY DOLLARS	\$ 100,000.00
32	Furnish and Install 24-inch Solid HDPE Gas Header	LF	2,200	\$ 140.00	ONE HUNDRED FORTY DOLLARS	\$ 308,000.00
33	Furnish and Install 1-inch Solid HDPE Air Line	LF	2,200	\$ 10.00	TEN DOLLARS	\$ 22,000.00
34	Furnish and Install 6-inch Solid HDPE Leachate Forcemain and Recirculation Pipe	LF	1,200	\$ 35.00	THIRTY-FIVE DOLLARS	\$ 42,000.00

CONDENSATE RECOVERY SYSTEM

35	Furnish and Install Condensate Recovery System	LS	1	\$ 50,000.00	FIFTY THOUSAND DOLLARS	\$ 50,000.00
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LEACHATE PUMP STATION

36	Furnish and Install Submersible Leachate Pump Station (Complete) with all Appurtenances	LS	1	\$ 500,000.00	FIVE HUNDRED THOUSAND DOLLARS	\$ 500,000.00
37	Remove, Replace and Improve Existing Cells 1 through 6 Leachate Pump Stations	EA	6	\$ 30,000.00	THIRTY THOUSAND DOLLARS	\$ 180,000.00

GROUNDWATER MONITORING SYSTEM

38	Furnish and Install Groundwater Monitoring System (Complete)	LS	1	\$ 300,000.00	THREE HUNDRED THOUSAND DOLLARS	\$ 300,000.00
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JET CLEAN AND VIDEO

39	Jet Clean New HDPE Piping	LF	9,000	\$ 1.00	ONE DOLLAR	\$ 9,000.00
40	Video Camera Inspect New Leachate Collection HDPE Piping	LF	3,600	\$ 1.00	ONE DOLLAR	\$ 3,600.00
41	Jet Clean Existing Leachate Collection HDPE Piping	LF	5,800	\$ 1.00	ONE DOLLAR	\$ 5,800.00
42	Video Camera Inspect Existing Leachate Collection HDPE Piping	LF	5,800	\$ 1.00	ONE DOLLAR	\$ 5,800.00

PRECAST CONCRETE STRUCTURES AND REINFORCED CONCRETE PIPE (RCP)

43	Furnish and Install Drop Inlet Structures (Complete)	EA	2	\$ 10,000.00	TEN THOUSAND DOLLARS	\$ 20,000.00
44	Furnish and Install Concrete Stilling Structure (Complete)	LS	1	\$ 7,000.00	SEVEN THOUSAND DOLLARS	\$ 7,000.00
45	Furnish and Install 24-inch RCP	LF	320	\$ 120.00	ONE HUNDRED TWENTY DOLLARS	\$ 38,400.00

LANDFILL ROADS AND RAMP

46	Furnish and Install 12-Inch Crushed Stone Perimeter Access Roadway	SY	6,000	\$ 20.00	TWENTY DOLLARS	\$ 120,000.00
1 47	Furnish and Install Asphalt Paved Access Road	SY	3,100	\$ 80.00	EIGHTY DOLLARS	\$ 248,000.00
48	Remove Existing Crushed Stone Surface and Furnish and Install Asphalt Paved Access Road	SY	3,100	\$ 70.00	SEVENTY DOLLARS	\$ 217,000.00
49	Furnish and Install Guardrail	LF	1,900	\$ 40.00	FORTY DOLLARS	\$ 76,000.00
50	Furnish and Install Landfill Access Ramp	LS	1	\$ 200,000.00	TWO HUNDRED THOUSAND DOLLARS	\$ 200,000.00

SEDIMENT AND EROSION AND STORMWATER CONTROL

51	Furnish and Install Riprap Lined Drainage Channel	LF	2,500	\$ 100.00	ONE HUNDRED DOLLARS	\$ 250,000.00
52	Re-establish Riprap Lined Drainage Channel	LF	1,200	\$ 100.00	ONE HUNDRED DOLLARS	\$ 120,000.00
53	Furnish and Install Sediment and Erosion Control	LS	1	\$ 500,000.00	FIVE HUNDRED THOUSAND DOLLARS	\$ 500,000.00
54	Furnish and Install Stormwater Diversion Berms for Cell 6 Runoff	LF	2,800	\$ 45.00	FORTY-FIVE DOLLARS	\$ 126,000.00
55	Furnish and Install Cell 7 Stormwater Segregation System	LS	1	\$ 350,000.00	THREE HUNDRED FIFTY THOUSAND DOLLARS	\$ 350,000.00

SEEDING AND MULCHING

56	Furnish and Install Temporary Seeding and Mulching	SY	58,100	\$ 0.25	ZERO DOLLARS AND TWENTY-FIVE CENTS	\$ 14,525.00
57	Furnish and Install Permanent Seeding and Mulching	SY	58,100	\$ 0.50	ZERO DOLLARS AND FIFTY CENTS	\$ 29,050.00

ELECTRICAL CONNECTIONS AND APPURTENANCES

58	Furnish and Install all Electrical Connections and Appurtenances	LS	1	\$ 300,000.00	THREE HUNDRED THOUSAND DOLLARS	\$ 300,000.00
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TESTING						
59	Complete Geomembrane Leak Location Survey	LS	1	\$ 25,000.00	TWENTY-FIVE THOUSAND DOLLARS	\$ 25,000.00

END OF CELL 7 (MSW LANDFILL) BID FORM

PHASE 7 (C&D LANDFILL) SUBTOTAL (ITEMS 1 THROUGH 12)

In Words: \$ ONE MILLION SEVEN HUNDRED ONE THOUSAND FIFTY DOLLARS

In Figures: \$ 1,701,050.00

CELL 7 (MSW LANDFILL) SUBTOTAL (ITEMS 13 THROUGH 59)

In Words: \$ EIGHT MILLION FOUR HUNDRED NINETY-FOUR THOUSAND SIX HUNDRED FIFTEEN DOLLARS

In Figures: \$ 8,494,615.00

PROJECT SUBTOTAL (ITEMS 1 THROUGH 59)

In Words: \$ TEN MILLION ONE HUNDRED NINETY-FIVE THOUSAND SIX HUNDRED SIXTY-FIVE DOLLARS

In Figures: \$ 10,195,665.00

PROJECT-LEVEL ITEMS - BID FORM						
Item	Item Description	Units	Scheduled Quantity	Unit Price		Total Amount (In Figures)
				(In Figures)	(In Words)	
60	Miscellaneous Work and Clean-up	LS	1	\$ 738,000.00	SEVEN HUNDRED THIRTY-EIGHT THOUSAND DOLLARS	\$ 738,000.00
61	Mobilization and De-mobilization	LS	1	\$ 800,000.00	EIGHT HUNDRED THOUSAND DOLLARS	\$ 800,000.00

PROJECT-LEVEL ITEMS - BID FORM

PROJECT SUBTOTAL (ITEMS 1 THROUGH 61)

In Words: \$ ELEVEN MILLION SEVEN HUNDRED THIRTY-THREE THOUSAND SIX HUNDRED SIXTY-FIVE DOLLARS

In Figures: \$ 11,733,665.00

62 5% Contingency Allowance (on Project Subtotal)

In Figures: \$ 586,683.25

TOTAL BASE BID (ITEMS 1 THROUGH 62)

In Words: \$ TWELVE MILLION THREE HUNDRED TWENTY THOUSAND THREE HUNDRED FORTY-EIGHT DOLLARS AND TWENTY-FIVE CENTS

In Figures: \$ 12,320,348.25

BID ALTERNATE						
Item	Item Description	Units	Scheduled Quantity	Unit Price		Total Amount (In Figures)
				(In Figures)	(In Words)	
63	Delete Riprap Lined Drainage Channel from Bid Item No. 51 and Furnish and Install Fabric-filled Concrete Lined Drainage Channel	LF	2,500	\$ <u>190.00</u>	<u>ONE HUNDRED NINETY DOLLARS</u>	\$ <u>475,000.00</u>

SUBTOTAL BID ALTERNATE (ITEMS 1 - 50, 52 - 61 and 63)

In Words: \$ ELEVEN MILLION NINE HUNDRED FIFTY-EIGHT THOUSAND SIX HUNDRED SIXTY-FIVE DOLLARS

In Figures: \$ 11,958,665

64 5% Contingency Allowance (on Subtotal Bid Alternate)

In Figures: \$ 597,933.25

TOTAL BID ALTERNATE (ITEMS 1 - 50, 52 - 61, 63 and 64)

In Words: \$ TWELVE MILLION FIVE HUNDRED FIFTY-SIX THOUSAND FIVE HUNDRED NINETY-EIGHT DOLLARS AND TWENTY-FIVE CENTS

In Figures: \$ 12,556,598.25

PROPOSED SUBCONTRACTORS AND SUPPLIERS:

Type	Name (License)	Address	Type and Extent of Work
SUB	HAYES ELECTRIC -	ASHEVILLE, NC	ELECTRICAL
SUB	ACE CLEARING -	ROBBINSVILLE, NC	CLEARING
SUB	RTC SOUTHERN -	GREENSBORO, NC	FABRICFORM CONCRETE
SUB	APAC HARRISON -	ASHEVILLE, NC	ASPHALT PAVING
SUB	TEXAS ENVIRONMENTAL -	CONROE, TX	LINER
SUB	HERDON HERNDON -	LUGOFF, SC	SEED + ESC
SUB	CAROLINA GUARDRAIL -	COLFAX, NC	GUARDRAIL
SUB	HAMILTON HAULING -	CANDLER, NC	HAULING

6. Bidder agrees that all Work required by the Contract Documents will be substantially completed as set forth in the Agreement (Section 00500).

Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work on time.

7. The following documents are attached to and made a condition of this Bid:
- (a) Section 00410 – Bid Security Form or Certified Check/Cashier's Check in the amount of 5% of Bidder's Base Bid Price
 - (b) Power of Attorney (for surety bond only)
 - (c) Evidence of Bidder's certification and license to perform the work and services
 - (d) Section 00310 – Minority Business Plan Compliance
 - (e) Article 11.5 of Section 00100 – Construction Schedule
 - (f) Section 00480 – Non-Collusive Affidavit
 - (g) Section 00485 – Authority to Execute Contract

8. Communications with Bidder concerning this Bid shall be addressed to:

Tasha A. Gardner, VP-Finance/CFO

378 Bennoch Road, PO Box 435

Stillwater, Maine 04489

9. The terms used in this Bid are defined in the General Conditions of the Construction Contract, included as part of the Contract Documents and have the meanings assigned to them in the General Conditions.

10. The Bidder executes this bid as one of the following:

An Individual

By: _____ (SEAL)
(Individual's Name and Signature)

Name of Business: _____

North Carolina Registration No.: _____

Business Address: _____

Telephone No.: (_____) _____

A Partnership

By: _____ (SEAL)
(Name and Signature)

Firm Name: _____ (SEAL)

North Carolina Registration No.: _____

Business Address: _____

Telephone No.: (_____) _____

A Corporation

By: Tasha A. Gardner Tasha A. Gardner (SEAL)

(Name of person authorized to sign and Signature)

Vice President-Finance/CFO

(Title)

Firm Name: Sargent Corporation

State of Incorporation: Maine

(Corporate Seal)

Attest: Carey L. Sheehan, Assistant Secretary

(Name of Secretary and Signature)

North Carolina Registration No.: _____

Business Address: 378 Bennoch Road, P.O. Box 435, Stillwater, Maine 04489

Telephone No.: (207) 827-3345

A Joint Venture*

By: _____

Firm Name: _____

State of Incorporation: _____

North Carolina Registration No.: _____

Business Address: _____

Telephone No.: (_____) _____

By: _____

Firm Name: _____

State of Incorporation: _____

North Carolina Registration No.: _____

Business Address: _____

Telephone No.: (_____) _____

- * (Each joint venturer member must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above. Add additional signature blocks as necessary).

END OF SECTION 00300

SECTION 00310

MINORITY BUSINESS PLAN COMPLIANCE REQUIREMENTS

See attached MBE forms.

MBE SUBCONTRACT GOALS:

The goals for participation by Minority firms as subcontractors for construction and repair projects have been set by the Buncombe County Board of Commissioners (hereinafter Board) at 12%.

The bidder must identify on MBE Form 1, the businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts or affidavit (Affidavit B) of self-performance of work, if bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to provide this evidence may result in rejection of the bid and award to the next low bidder.

MINIMUM COMPLIANCE REQUIREMENTS:

If the MBE subcontract goals are not achieved, the Bidder shall provide the following documentation to the Board.

1. MBE Utilization Commitment (MBE Form 1) with the bid.

2. Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions (upon request prior to award). This documentation shall include the following evidence:
 - A. Copies of solicitations for quotes to at least three (3) MBE firms from the source list provided by the Minority -Business Development Agency of the Small Business Development Division, North Carolina Department of Economic & Community Development (hereinafter Minority Business Development Agency) 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 an MBE firm is not considered to be the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
 - E. Documentation of any contacts, correspondence or conversation with MBE firms made in an attempt to meet the goals.

Note: If the Bidder provides sufficient evidence (listed in #1) that the goals stated in the contract documents have been met, or awards all subcontracts to MBE'S, the documentation listed in #2 will not be required.

Upon being named apparent low bidder, the Bidder shall provide a Letter of Intent (MBE) Form 3), complete with a description of the scope of services and dollar value from each MBE firm proposed for use in this contract. 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. The Board reserves the right to waive any irregularities in MBE documentation if they can be resolved prior to award of the contract, and the Board finds it to be in its best interest to do so and award the contract.

SUBCONTRACTOR PAYMENT REQUIREMENTS:

North Carolina General Statute 143-134. 1, states that the percentage of retainage on payment made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the Board to the prime contractor. Failure to comply with this provision shall be considered a breach of the contract, and the contract may be terminated in accordance with the termination provisions of the contract.

The Contractor shall provide an itemized statement of payments to each MBE subcontractor with each request for payment or before final payment is processed.

PROGRAM COMPLIANCE REQUIREMENTS:

All written statements, certification or intentions made by the Bidder shall become a part of the agreement between the Contractor and the Board for performance of this contract. Failure to comply with any of these states, certifications, or intentions, or with the MBE Guidelines shall constitute a breach of the contract. A finding by the Board 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 Board whether to terminate the contract for breach.

In determining whether a contractor has made good faith efforts, the Board will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of there efforts. The Board may take into account any or all of the following:

1. Whether the Bidder attended any prebid meetings that were scheduled by the Board;
2. Whether the Bidder advertised in general circulation, trade association, and minority-focus media concerning the subcontracting opportunities;
3. Whether the Bidder provided written notice to a minimum of three MBE's for each portion of the work subcontract, that their interest in the contract was being solicited in sufficient time to allow the MBE's to participate effectively;
4. Whether the Bidder followed up initial solicitations of interest by contacting MBE's to determine with certainty whether the MBE's were interested;
5. Whether the Bidder selected portions of the work to be performed by MBE's in order to increase the likelihood of meeting MBE goals (including, where appropriate, breaking down contracts into economically feasible units to facilitate MBE participation);
6. Whether the Bidder provided interested MBE's with adequate information about the plans, specifications and requirements of the contract;
7. Whether the Bidder negotiated in good faith with interested MBE's not rejecting MBE's as unqualified without sound reasons based on a thorough investigation of their capabilities.

Identification of HUB Certified/ Minority Business Participation

I, Sargent Corporation

(Name of Bidder)

do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #

Work Type

*Minority
Category**HUB
Certified
(Y/N)[illegible]

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

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be (\$) 420,000.00

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of Penobscot, Maine

(Name of Bidder)

Affidavit of Sargent Corporation

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 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 business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: 1/20/2022 Name of Authorized Officer: Tasha A. Gardner

Signature: Tasha A. Gardner

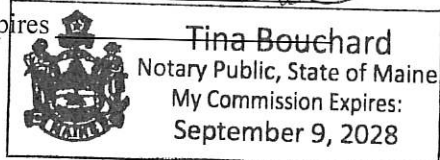
Title: Vice President-Finance/CFO

State of Maine, County of Penobscot

Subscribed and sworn to before me this 20 day of January 20 22

Notary Public Tina Bouchard

My commission expires



**State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract
with Own Workforce.**

County of _____

Affidavit of _____

(Name of Bidder)

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

(Name of Project)

contract.

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform 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 Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

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 _____

SECTION 00410

BID SECURITY FORMS

KNOW ALL MEN BY THESE PRESENTS, that we SARGENT CORPORATION, as Principal, hereinafter called the Principal, and the N/A of TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA, a Corporation duly organized under the laws of the State of CONNECTICUT as Surety, hereinafter called the Surety, are held and firmly bound unto Buncombe County as obligee, hereinafter called the Owner, in the amount of FIVE PERCENT OF ATTACHED BID Dollars (\$*5%*), for the payment of which amount and truly to be made, the Principal and the Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a Bid for BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL) CONSTRUCTION PROJECT, BUNCOMBE COUNTY, NC, FILE NO. 02220306.09

NOW THEREFORE, if the Owner shall accept the Bid of the Principal and the Principal shall enter into a Contract with the Owner in accordance with the terms of said Bid, and give such bond or bonds as may be specified in the Bidding and Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and materials furnished in the prosecution thereof, or in the event of the failure of the Principal to enter into such Contract and give such bond or bonds the Surety shall, upon demand forthwith pay to the Owner-Obligee the amount set forth above. The Principal shall pay the Owner the difference not to exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said Bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

SIGNED AND SEALED this 12TH day of JANUARY, 2022 in the presence of:

Witness [Signature]
SARGENT CORPORATION
Tasha A. Gardner (SEAL)
Principal
TASHA A. GARDNER, VP-FINANCE/CFO
Title

Witness [Signature]
TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
Robert E. Shaw, Jr. (SEAL)
Surety
ROBERT E. SHAW, JR., ATTORNEY-IN-FACT
Title
SKILLINGS SHAW & ASSOCIATES
103 PARK STREET PO BOX 481
LEWISTON, ME 04243
207-753-7300

END OF SECTION 00410



**Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company**

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **Robert E Shaw Jr** of **LEWISTON**, **Maine**, their true and lawful Attorney(s)-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **21st** day of **April**, 2021.



State of Connecticut

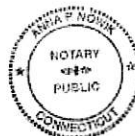
City of Hartford ss.

By: 
Robert L. Raney, Senior Vice President

On this the **21st** day of **April**, 2021, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of each of the Companies, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June**, 2026




Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of each of the Companies, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of each of the Companies, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **12TH** day of **JANUARY**, 2022




Kevin E. Hughes, Assistant Secretary

**To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney(s)-in-Fact and the details of the bond to which this Power of Attorney is attached.**

SECTION 00480

NON-COLLUSIVE AFFIDAVIT
(Submit with bid documents)

State of Maine)

County of Penobscot)

Tasha A. Gardner being first duly sworn, deposes and says that:

- (1) He/She is the VP-Finance/CFO, (Owner, Partner, Officer, Representative or Agent) of Sargent Corporation the Bidder that has submitted the attached Bid;
- (2) He/She is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;
- (3) Such Bid is genuine and is not a collusive or sham Bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other Bidder, firm, or person to submit a collusive or sham Bid in connection with the Work for which the attached Bid has been submitted; or to refrain from bidding in connection with such Work; or have in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference with any Bidder, firm, or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit, or cost elements of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against (Recipient), or any person interested in the proposed Work;
- (5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the Bidder or any other of its agents, representatives, owners, employees or parties in interest, including this affidavit.

BY Tasha A. Gardner
ITS Tasha A. Gardner, Vice President-Finance/CFO
(Title)

Subscribed and sworn to before me

this 20th day of January, 2022.

Tina Bouchard

My commission expires  **Tina Bouchard**
Notary Public, State of Maine
My Commission Expires:
September 9, 2028

END OF SECTION 00480

SECTION 00485

AUTHORITY TO EXECUTE CONTRACT

If the Bidder is a Corporation, attach to this page a certified copy of corporate resolutions of the Board of Directors of the Corporation authorizing an officer of the Corporation to execute the Agreement contained within this document on behalf of the Corporation.

END OF SECTION 00485



Certificate of Corporate Vote

I, Tasha A Gardner, of Brewer, Penobscot County, Maine, certify as follows:

1. That I am the duly elected and qualified secretary of SARGENT CORPORATION, a Maine corporation with a principal place of business at Stillwater, Penobscot County, Maine;
2. That by unanimous action of the Board of Directors of SARGENT CORPORATION (the "Corporation"), dated May 18, 2018, the following resolutions were adopted:

RESOLVED: That, as of January 4, 2021, any one of the officers of the Corporation named below, acting singly, be and hereby is authorized to execute and deliver, on behalf of the Corporation, any and all quotes, bids, and contracts arising in the business operations of the Corporation.

President, CEO	Herbert R. Sargent
Vice President-Finance, CFO	Tasha A. Gardner
Vice President-Operations, COO	Eric G. Ritchie
Mid-Atlantic Regional Manager	Justin E. Porter
Treasurer	Tasha A. Gardner
Secretary	Tasha A. Gardner
Assistant Secretary	Carey L. Sheehan

3. That the foregoing resolutions are in full force and effect.

Dated: January 3, 2022


Tasha A. Gardner, Secretary

Corporate Headquarters

Telephone: 207-827-4435
Fax: 207-827-6150
378 Bennoch Road
P.O. Box 435
Stillwater, ME 04489

New Hampshire Operations

Telephone: 603-734-2132
Fax: 603-734-2197
25 Spaulding Road
Unit 19
Fremont, NH 03044

Mid-Atlantic Operations

Telephone: 804-368-7118
Fax: 804-368-7387
11139 Air Park Road
Suite 1
Ashland, VA 23005

sargent.us



SARGENT
Board of Directors

Name	Residence/Business Address	Date Office Assumed
Herbert R. Sargent, President/CEO	378 Bennoch Road, Stillwater, ME Ph. 207-827-4435	12/31/2005
Tasha A. Gardner, Vice President-Finance/CFO, Secretary, Treasurer	378 Bennoch Road, Stillwater, ME Ph., 207-827-4435	09/25/2017
George M. Thomas	378 Bennoch Road, Stillwater, ME Ph. 207-827-4435	09/25/2017
Keith M. Bennett	378 Bennoch Road, Stillwater, ME Ph. 207-827-4435	08/16/2018

*No Expiration on Term of Office. All will serve until they resign or are removed.

Corporate Headquarters

Telephone: 207-827-4435
Fax: 207-827-6150
378 Bennoch Road
P.O. Box 435
Stillwater, ME 04489

New Hampshire Operations

Telephone: 603-734-2132
Fax: 603-734-2197
25 Spaulding Road
Unit 19
Fremont, NH 03044

Mid-Atlantic Operations

Telephone: 804-368-7118
Fax: 804-368-7387
11139 Air Park Road
Suite 1
Ashland, VA 23005

sargent.us

SECTION 00500

AGREEMENT

THIS AGREEMENT made as of the _____ day of _____ in the year _____ by and between Buncombe County, North Carolina, hereinafter called Owner, and

with legal address and principal place of business at

hereinafter called Contractor. Owner and Contractor in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

1.1 Contractor shall perform the Work as specified or indicated in the Contract Documents. The Work generally consists of the following at the existing Buncombe County Solid Waste Management Facility:

1. Cell 7 – Construction of a ±13.5-acre Subtitle D Landfill expansion complete with a composite bottom liner system, a leachate collection system, and appurtenances, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, seeding and mulching, storm drainage, and perimeter access road construction.
2. Phase 7 – Construction of a ±5.5-acre C&D Landfill expansion, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, landfill soil base, seeding and mulching, storm drainage, and access road construction.

ARTICLE 2. ENGINEER.

2.1 The Project has been designed by SCS Engineers, PC, 2520 Whitehall Park Drive, Suite 450, Charlotte, North Carolina 28273, who will act as Engineer in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIME.

3.1 The Project will be considered substantially complete (complete as generally defined on Sheets C-5 and C-9 of the Drawings) upon construction of the Cell 7 and Phase 7 disposal area, access roads, groundwater monitoring system, leachate pump station and forcemain, Sediment Pond No. 2, stormwater control structures, certification surveys, successful performance of all testing requirements including cleaning and video inspection of all new leachate pipes and all else incidental to the Work. The work shall be substantially completed in accordance with the

General Conditions within 270 calendar days from (and including) the date when the Notice to Proceed is issued.

- 3.2 All work shall be complete and ready for final payment in accordance with the General Conditions within 300 calendar days from (and including) the date when the Notice-to-Proceed is issued.

ARTICLE 4. CONTRACT PRICE.

- 4.1 Owner will pay Contractor for performance of the Work in accordance with the Contract Documents in current funds at the unit prices agreed upon in the Contractor's Bid Form attached to this Agreement.

ARTICLE 5. APPLICATIONS FOR PAYMENT

- 5.1 Contractor shall submit Applications for Payment in accordance with the General Conditions of the Contract and Section 01027. Applications for Payment will be processed by Engineer as provided in the General Conditions of the Contract.

ARTICLE 6. PROGRESS AND FINAL PAYMENTS

- 6.1 Owner will make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer, monthly during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values provided for in the General Conditions of the Contract.
- 6.2 Progress payments will be in an amount equal to 90% of the value of the Work completed and 90% of materials (excluding soils) and equipment not incorporated in the Work but delivered and suitably stored, less, in each case, the aggregate of payments previously made.
- 6.3 Upon Substantial Completion of the Work, Owner may pay an amount sufficient to increase total payments to Contractor to 95% of the Contract Price, less retainages as Engineer shall determine, in accordance with the General Conditions of the Contract.
- 6.4 Upon final inspection and acceptance of the Work, in accordance with of the General Conditions of the Contract, Owner will pay the remainder of the Contract Price as recommended by Engineer.

ARTICLE 7. LIQUIDATED DAMAGES

- 7.1 Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the Contract Time specified in Article 3 above, plus any extensions thereof allowed in accordance with Article 14 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving, in a legal proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner as follows:

\$22,000 per day for each calendar day of delay until the Work as defined in Article 3 has reached substantial completion.

\$500 per day for each calendar day of delay until the Work as defined in Article 3 has reached final completion.

- 7.2 Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is for reasons included in Article 14 of the General Conditions.
- 7.3 Contractor shall furnish Owner the required notification of such delays in accordance with Article 14 of the General Conditions.

ARTICLE 8. ASSURANCE

- 8.1 Contractor has familiarized himself with the nature and extent of the Contract Documents, Work, locality, and with all local conditions and Federal, State and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work.
- 8.2 Contractor has studied carefully all reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which were relied upon by Engineer in the preparation of the Drawings and Specifications and which have been identified in Article 5 of the General Conditions.
- 8.3 Contractor has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to in the above paragraph as he/she deems necessary for the performance of the Work at the Contract Price within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by him/her for such purposes.
- 8.4 Contractor has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.
- 8.5 Contractor has given Engineer written notice of any conflict, error or discrepancy that he/she has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Contractor.
- 8.6 Contractor agrees that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 9. CONTRACT DOCUMENTS.

- 9.1 The Contract Documents which comprise the Contract between Owner and Contractor are attached hereto and made a part hereof and consist of the following:
 - A. Advertisement for Bids (Section 00020)
 - B. Instructions to Bidders (Section 00100)

- C. Bid Form (Section 00300)
- D. Minority Business Plan (Section 00310)
- E. Non-Collusive Affidavit (Section 00480)
- F. Authority to Execute Contract (Section 00485)
- G. This Agreement (Section 00500)
- H. Construction Performance Bond, Construction Labor and Material Payment Bond, and other required Bonds
- I. Certificate of Insurance
- J. General Conditions (Section 00700)
- K. Specifications (as listed in Table of Contents)
- L. Drawings bearing the general title "Buncombe County Solid Waste Management Facility, Cell 7 (MSW Landfill) and Phase 7 (C&D Landfill) Construction Project" dated December 2021
- M. Project Manual bearing the general title "Buncombe County Solid Waste Management Facility, Cell 7 (MSW Landfill) and Phase 7 (C&D Landfill) Construction Project" dated December 2021
- N. Addenda numbers [] to [], inclusive
- O. Any modification, including Change Orders, duly delivered after execution of Agreement.

ARTICLE 10. MISCELLANEOUS

- 10.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions of the Contract shall have the meanings assigned in the General Conditions of the Contract.
- 10.2 Neither Owner nor Contractor shall, without the prior written consent of the other, assign or sublet in whole or in part his/her interest under any of the Contract Documents; and, specifically but without limitation, Contractor shall not assign any monies due or to become due without the prior written consent of Owner. In case Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for in this Contract.

- 10.3 Owner and Contractor each binds himself, his/her partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.
- 10.4 The Contract Documents constitute the entire agreement between Owner and Contractor and may only be altered, amended or repealed by a Modification.

ARTICLE 11. INSURANCE

11.1 **Insurance:**

- a. Contractor agrees their insurance policies shall be endorsed evidencing the minimum insurance coverage and limits set forth below prior to the County's signing of this Agreement. The insurance coverage and limits set forth below shall be deemed minimum coverage limits and shall not be construed in any way as a limitation on Contractor's duty to carry adequate insurance. All policies of insurance shall be primary insurance and non-contributory with respect to all other available sources. The minimum insurance coverage which the Contractor shall procure and maintain at its sole cost and expense during the term of the Agreement is as follows:
- i. **Worker's Compensation.** Coverage at the statutory limits in compliance with applicable State and Federal laws. Contractor shall ensure that any subcontractors also have workers compensation coverage at the statutory limits.
 - ii. **Employer's Liability.** Coverage with minimum limits of \$1,000,000 each employee accident and \$1,000,000 each employee disease.
 - iii. **Commercial General Liability.** Insurance covering all operations performed by the Contractor with a minimum limit of \$5,000,000 per occurrence with a \$5,000,000 aggregate. Coverage shall not contain any endorsement(s) excluding nor limiting Product/Completed Operations or Contractual Liability. Buncombe County shall be named as an additional insured under the policy.
 - iv. **Business Automobile Liability.** Insurance covering all owned, non-owned, and hired vehicles used in performance of this Agreement. The minimum combined single limit per occurrence shall be \$1,000,000 and shall include uninsured/underinsured motorist coverage per N.C. Gen. Stat. § 20-279.21.
 - v. **Builder's Risk.** Contractor shall purchase and maintain property insurance (commonly known as Builder's Risk) in the amount of the initial contract plus values of subsequent modification, change orders, and loss of materials supplied or installed by others comprising the value of the entire project at the site on a replacement cost basis (subject to such deductible amounts as may be required by laws and regulations). Such builder's risk insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed to in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than Buncombe County has insurable interest in the property to be covered, whichever is earlier. This insurance shall include the interests of the Owner, Contractor, financing

institution (if applicable), Subcontractors, Owner's Representatives and Owner's Representative's Consultants in the Work. If the construction involves work on existing structures, such coverage shall be provided through Installation Floater Coverage written on a Special Covered Cause of Loss Form and shall, in any event, include theft, faulty workmanship, mechanical or electrical damage during testing and labor costs to repair damaged work, and soft costs (expediting expenses); deletion of any coinsurance provision is also required; any exclusions for underground exposures shall be deleted. Flood and Earthquake coverages are also to be provided. Coverage shall only end when the work is accepted by Buncombe County.

- vi. **Contractor's Pollution Liability.** If the Contractor's commercial general liability policy referenced above does not include an endorsement including the Limited Pollution Liability Extension, Contractor will be required to purchase a Pollution Liability policy with limits of \$1,000,000 per loss and \$2,000,000 aggregate. Contractor shall keep this policy in effect 3 years after completion of the project. Buncombe County shall be named as an additional insured with respect to liability and defense of suits arising out of the activities performed by, or on behalf of the Contractor, including completed operations.

b. Additional Insurance Provisions.

- i. If the Contractor maintains higher limits than the minimums shown above, the County requires and shall be entitled to coverage for the higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the County.
 - ii. The Contractor shall provide the County with certificates of insurance on an approved form, evidencing the above amounts. Buncombe County shall be named as additional insureds under the commercial general liability policy. Each insurance policy required by this Contract must be in effect at or prior to commencement of work under the Contract and remain in effect for the duration of the Agreement.
 - iii. Each insurance policy required above shall state that coverage shall not be canceled, except with written notice to the County, delivered in accordance with the policy provisions. All insurance shall be procured from reputable insurers authorized and qualified to do business in North Carolina with a rating of A- VII or better as determined by A. M. Best Company and shall be in a form acceptable to the County.
 - iv. Contractor shall require and verify that all subcontractors maintain insurance meeting all the requirements stated herein, and Contractor shall ensure that Buncombe County are additional insureds on insurance required from subcontractors.
- c. **Waiver of Subrogation:** Contractor hereby grants to County a waiver of any right to subrogation which any insurer of said Contractor may acquire against the County by virtue

of payment of any loss under such insurance. Contractor agrees to obtain any endorsement that may be necessary to affect this waiver of subrogation.

- d. The limits of coverage under each insurance policy maintained by the Contractor shall not be interpreted as limiting the Contractor's liability and obligations under this Agreement.
- e. Nothing in this section is intended to affect or abrogate Buncombe County's governmental immunity.

IN WITNESS WHEREOF, the parties hereto have signed this Agreement. Two copies each have been delivered to Owner and one copy each to Contractor and Engineer. All portions of the Contract Documents have been signed or identified by Owner and Contractor or by Engineer on their behalf.

This Agreement shall become effective on _____, 20__.

OWNER

CONTRACTOR

BY

BY

(CORPORATE SEAL)

(CORPORATE SEAL)

Attest

Attest

Address for giving notices

Address for giving notices

Note: If Contractor is a corporation, an affidavit giving the principal the right to sign the Agreement must accompany the executed Agreement.

END OF SECTION 00500

SECTION 00610

PERFORMANCE BOND

NORTH CAROLINA)
)
BUNCOMBE COUNTY)

KNOW ALL MEN BY THESE PRESENTS: that

_____ (Name of Contractor)
incorporated under the law of _____, having its principal office at
_____ hereinafter called the Principal and
_____, incorporated under the laws of the State of
_____, and having its office at _____,
hereinafter called the Surety, are held and firmly bound unto the COUNTY OF BUNCOMBE in an
amount of _____ DOLLARS (_____), lawful money of
the United States, to be paid to the said Obligee or its successors or assigns, to which payment well and
truly to be made we, the Principal and Surety, bind ourselves and our successors, jointly and severally,
firmly by these present.

WHEREAS, the Principal has entered into a certain contract with the Obligee above named, bearing
date of _____, 20__, (copy of which is attached here to) whereby the Principal has agreed to
the construction of the BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY, CELL 7
(MSW LANDFILL) AND PHASE 7 (C&D LANDFILL) CONSTRUCTION PROJECT and to perform
other work as specified in said contract, which contract is by reference incorporated herein.

NOW, THEREFORE, the conditions of this obligation are such that (1) if the Principal shall
faithfully perform the contract on its part, and shall satisfy all claims and demands incurred for the same,
and shall fully indemnify and save harmless the Obligee from all cost and damages which it may suffer by
reason of failure to do so, and shall fully reimburse and repay the Obligee for all outlay and expenses
which it may incur in making good any default, (2) and shall pay for all labor done on, and materials and
supplies furnished for, the said work, (3) and shall pay all damages, either to person or property, which
any person may sustain on account of defective or unsafe performance of the contract, caused by the
negligence, wrongful acts or violation of law, on the part of the principal, or its agents or servants, and
shall indemnify and save harmless the said Obligee from all claims, damages or liability, caused by such
defective or unsafe performance of the contract, then this obligation shall be null and void, otherwise it

shall remain in full force and effect; provided that any alterations which may be made in the terms of the contract and the work to be done under it, or the giving of the Obligee of any extension of time for the performance of the Contract, or any other forbearance on the part of either the Obligee or the Principal to the other, shall in no way release the Principal or Surety or either of them, their successor and assigns, from liability hereunder. Notice of the Surety of any such alteration, extension or forbearance, being expressly waived.

It is further agreed that the Surety has been duly licensed by the Insurance Commissioner to do business in this State as a Fidelity Insurance Company; that it has complied with the laws of the State relative to Fidelity Insurance Companies.

It is further agreed that neither the insolvency, adjudication of bankruptcy, nor discharge in bankruptcy or the Principal shall in any way discharge or impair the obligations herein undertaken by the Surety, and that notwithstanding the discharge of the Principal by operation of law in such cases, the Surety shall remain bound by this undertaking.

Signed and sealed this _____ day of _____ 20 ____

Attest:

Secretary

By _____ (SEAL)

President Principal

NAME OF COMPANY

North Carolina Resident Agent

By _____

N.C. Surety-

Authorized Signature

North Carolina Address

END OF SECTION 00610

SECTION 00620

LABOR AND MATERIAL PAYMENT BOND

NORTH CAROLINA)
)
BUNCOMBE COUNTY)

KNOW ALL MEN BY THESE PRESENTS, _____ incorporated under the law of _____, having its principal office at _____ hereinafter called the Principal and _____, incorporated under the laws of the State of _____, and having its office at _____, hereinafter called the Surety, are held and firmly bound unto the COUNTY OF BUNCOMBE, in an amount of _____ DOLLARS (_____), lawful money of the United States, to be paid to the said Obligee or its successors or assigns, to which payment well and truly to be made we, the Principal and Surety, bind ourselves and our successors, jointly and severally, firmly by these present.

WHEREAS, the Principal has entered into a certain contract with the Obligee above named, bearing date of _____, 20____, (copy of which is attached here to) whereby the Principal has agreed to the construction of the BUNCOMBE COUNTY SOLID WASTE MANAGEMENT FACILITY, CELL 7 (MSW LANDFILL) AND PHASE 7 (C&D LANDFILL) CONSTRUCTION PROJECT and to perform other work as specified in said contract, which contract is by reference incorporated herein.

NOW, THEREFORE, the conditions of this obligation are such that the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue. Action may be brought on this bond under Article 3, Section 44A of the General Statutes of the State of North Carolina any may be brought in the name of the person aggrieved.

It is further agreed that the Surety has been duly licensed by the Insurance Commissioner to do business in this State as a Fidelity Insurance Company; that it has complied with the laws of the State relative to Fidelity Insurance Companies.

It is further agreed that neither the insolvency, adjudication of bankruptcy, nor discharge in bankruptcy of the Principal shall in any way discharge or impair the obligations herein undertaken by the Surety, and that notwithstanding the discharge of the Principal by operation of law in such cases, the Surety shall remain bound by this undertaking.

Signed and sealed this _____ day of _____ 20 _____

Attest:

Secretary

By _____ (SEAL)
President Principal

NAME OF COMPANY

North Carolina Resident Agent

By _____
N.C. Surety-Authorized Signature

North Carolina Address

END OF SECTION 00620

SECTION 00670

NOTICE TO PROCEED

DATED: _____

TO: _____

ADDRESS: _____

CONTRACT: _____

PROJECT: _____

OWNER'S CONTRACT NO. _____

You are notified that the Contract Times under the above contract will commence to run on _____. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Agreement the date of Substantial Completion is _____ and the date of readiness for final payment is _____.

Before you may start any Work at the Site, Paragraph 2.01 of the General Conditions provides that you must deliver to the Owner (with copies to Engineer and other identified additional insureds) certificates of insurance which you are required to purchase and maintain in accordance with the Contract Documents.

(OWNER)

BY: _____
(Authorized Signature)

(Title)

Copy to Engineer

NOTE: Attach this notice to your contract making it a part thereof.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1—Definitions and Terminology.....	1
1.01 Defined Terms.....	1
1.02 Terminology	6
Article 2—Preliminary Matters	7
2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance.....	7
2.02 Copies of Documents	7
2.03 Before Starting Construction	7
2.04 Preconstruction Conference; Designation of Authorized Representatives	8
2.05 Acceptance of Schedules	8
2.06 Electronic Transmittals	8
Article 3—Contract Documents: Intent, Requirements, Reuse	9
3.01 Intent.....	9
3.02 Reference Standards	9
3.03 Reporting and Resolving Discrepancies	10
3.04 Requirements of the Contract Documents.....	10
3.05 Reuse of Documents	11
Article 4—Commencement and Progress of the Work	11
4.01 Commencement of Contract Times; Notice to Proceed	11
4.02 Starting the Work.....	11
4.03 Reference Points	12 11
4.04 Progress Schedule	12
4.05 Delays in Contractor’s Progress	12
Article 5—Site; Subsurface and Physical Conditions; Hazardous Environmental Conditions	14 13
5.01 Availability of Lands	14 13
5.02 Use of Site and Other Areas.....	14
5.03 Subsurface and Physical Conditions.....	15
5.04 Differing Subsurface or Physical Conditions	16

5.05	Underground Facilities	17
5.06	Hazardous Environmental Conditions at Site	19
Article 6—Bonds and Insurance.....		21
6.01	Performance, Payment, and Other Bonds	21
6.02	Insurance—General Provisions	22
6.03	Contractor’s Insurance	24
6.04	Builder’s Risk and Other Property Insurance	25
6.05	Property Losses; Subrogation	25
6.06	Receipt and Application of Property Insurance Proceeds	26 27
Article 7—Contractor’s Responsibilities		27
7.01	Contractor’s Means and Methods of Construction	27
7.02	Supervision and Superintendence	27
7.03	Labor; Working Hours	27
7.04	Services, Materials, and Equipment	28
7.05	“Or Equals”	28
7.06	Substitutes	29
7.07	Concerning Subcontractors and Suppliers	31
7.08	Patent Fees and Royalties	32
7.09	Permits	33
7.10	Taxes	33
7.11	Laws and Regulations.....	33
7.12	Record Documents.....	34 33
7.13	Safety and Protection.....	34
7.14	Hazard Communication Programs	35
7.15	Emergencies	35
7.16	Submittals	35
7.17	Contractor’s General Warranty and Guarantee	38
7.18	Indemnification	39
7.19	Delegation of Professional Design Services	39
Article 8—Other Work at the Site		40
8.01	Other Work	40
8.02	Coordination	41
8.03	Legal Relationships.....	41

Article 9—Owner’s Responsibilities	42
9.01 Communications to Contractor	42
9.02 Replacement of Engineer	42
9.03 Furnish Data	42
9.04 Pay When Due	43 42
9.05 Lands and Easements; Reports, Tests, and Drawings	43
9.06 Insurance	43
9.07 Change Orders	43
9.08 Inspections, Tests, and Approvals	43
9.09 Limitations on Owner’s Responsibilities	43
9.10 Undisclosed Hazardous Environmental Condition	43
9.11 Evidence of Financial Arrangements	43
9.12 Safety Programs	43
Article 10—Engineer’s Status During Construction	44
10.01 Owner’s Representative	44
10.02 Visits to Site	44
10.03 Resident Project Representative	44
10.04 Engineer’s Authority	44
10.05 Determinations for Unit Price Work	45
10.06 Decisions on Requirements of Contract Documents and Acceptability of Work	45
10.07 Limitations on Engineer’s Authority and Responsibilities	45
10.08 Compliance with Safety Program	45
Article 11—Changes to the Contract	46
11.01 Amending and Supplementing the Contract	46
11.02 Change Orders	46
11.03 Work Change Directives	46
11.04 Field Orders	47
11.05 Owner-Authorized Changes in the Work	47
11.06 Unauthorized Changes in the Work	47
11.07 Change of Contract Price	47
11.08 Change of Contract Times	49
11.09 Change Proposals	49
11.10 Notification to Surety	50

Article 12—Claims.....	50
12.01 Claims.....	50
Article 13—Cost of the Work; Allowances; Unit Price Work	51
13.01 Cost of the Work	51
13.02 Allowances	55
13.03 Unit Price Work.....	55
Article 14—Tests and Inspections; Correction, Removal, or Acceptance of Defective Work	56
14.01 Access to Work.....	56
14.02 Tests, Inspections, and Approvals.....	56
14.03 Defective Work	57
14.04 Acceptance of Defective Work.....	58
14.05 Uncovering Work	58
14.06 Owner May Stop the Work	58
14.07 Owner May Correct Defective Work.....	59
Article 15—Payments to Contractor; Set-Offs; Completion; Correction Period	59
15.01 Progress Payments.....	59
15.02 Contractor’s Warranty of Title	62
15.03 Substantial Completion.....	62
15.04 Partial Use or Occupancy	63
15.05 Final Inspection	64
15.06 Final Payment.....	64
15.07 Waiver of Claims	65
15.08 Correction Period	66
Article 16—Suspension of Work and Termination	67
16.01 Owner May Suspend Work	67
16.02 Owner May Terminate for Cause.....	67
16.03 Owner May Terminate for Convenience.....	68
16.04 Contractor May Stop Work or Terminate	68
Article 17—Final Resolution of Disputes	69
17.01 Methods and Procedures.....	69
Article 18—Miscellaneous	69
18.01 Giving Notice	69
18.02 Computation of Times	69

18.03	Cumulative Remedies	70
18.04	Limitation of Damages	70
18.05	No Waiver	70
18.06	Survival of Obligations	70
18.07	Controlling Law	70
18.08	Assignment of Contract	70
18.09	Successors and Assigns	71 70
18.10	Headings.....	71 70

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
- 11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 - 12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
 - 13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
 - 14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
 - 15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
 - 16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
 - 17. *Cost of the Work*—See Paragraph 13.01 for definition.
 - 18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
 - 19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
 - 20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
 - 21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the 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 is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. 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 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: Owner shall, upon request from Contractor, provide certificates of insurance, other evidence of insurance, and/or evidence of self-insurance. Nothing herein shall be construed as a waiver on the part of the Owner to any defense of any claim, including, but not limited to, the defense of governmental immunity. After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 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;

2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-

term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. 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.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations*
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract

Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. 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).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as

possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or 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 its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. ~~In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.~~

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or

adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.
- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
- 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration-mediation or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify, defend, and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (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) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures*: 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 - 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 - 3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.
- D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 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;
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 - 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and 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 the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. 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 Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, 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 required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. 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 Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

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;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly 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 condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such 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 the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

~~I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.~~

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (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) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur:* Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be ~~written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance maintained consistent with the Owner's self-insured retention and excess coverage policies,~~ and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. ~~*Property Insurance for Substantially Complete Facilities:* Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.~~
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. ~~The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against~~

~~Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.~~

- ~~1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.~~
- ~~2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.~~
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
- ~~1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.~~
- C. ~~The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.~~
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy.

Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. 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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.
- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any

other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

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- C. 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 stated in the Contract Documents, all Work at the Site will be performed during the hours of regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld. 7:00am until 7:00pm, Monday through Saturday. Contractor will not perform Work on Sundays, or the following holidays: New Year's Day, July 4th, Thanksgiving Day, and Christmas Day. Contractor may perform Work outside regular working hours on Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For

the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

- a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
 - b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for

review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item 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 other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall

initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. 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 an 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 will be disclosed in the Contract Documents.
- ~~B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (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) arising out of or relating to 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 specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.~~
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims,

costs, losses, and damages (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) arising out of or relating to 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.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. 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.

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. ~~Neither Owner nor Engineer~~ shall not be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (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) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer 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 individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

- c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
 3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. 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 and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted

or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

- c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to reasonably rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;
 6. The issuance of a notice of acceptability by Engineer;
 7. The end of the correction period established in Paragraph 15.08;
 8. Any inspection, test, or approval by others; or
 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (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) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will 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 individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- D. Owner and Engineer shall be entitled to [reasonably](#) rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate

with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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 so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price

will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (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) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall 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 performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer 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.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's 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 performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. 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 performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. 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, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.
- B. *Change Proposal Procedures*
 - 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
 - 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety 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), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed 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, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any 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 and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, 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.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. 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.
- f. 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 of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 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.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. 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 performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances*: Contractor agrees that:
1. the cash 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
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. 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 unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. 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. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. 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.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 Defective Work

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). 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 approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then 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 will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or 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, 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 to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement 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.
 - 2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, 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.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. 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.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. 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; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. 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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, 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.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable 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, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either 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 Paragraph 15.03 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.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly 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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* 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 have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment 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 for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (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) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. 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 Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
1. Contractor's persistent failure 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);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. 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;
 - 2. 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; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
- ~~1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;~~
 12. agree with the other party to submit the dispute to another dispute resolution process;
or
 23. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction submit the claim to the Buncombe County Superior Court consistent with Sec. 18.07 below.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract 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~~Buncombe County, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto 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. 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.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall 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.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

- A. This Contract shall be governed by the laws of the State of North Carolina and should any claim or dispute arise between the Parties that cannot be resolved amicably, then any action to enforce or interpret its terms shall be brought in the General Court of Justice of Buncombe County, North Carolina which shall have venue and jurisdiction over the subject matter and the Parties. All rights and remedies of Owner under this Contract shall be cumulative and none shall exclude any other rights or remedies allowed by law or by equity. The Parties hereby agree that this paragraph establishes exclusive and sole venue and jurisdiction for any legal proceeding in Buncombe County, North Carolina.~~This Contract is to be governed by the law of the state in which the Project is located.~~

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

18.12 *Compliance with Laws*

- A. Contractor and Engineer shall comply with all state, federal, and local laws, ordinances, codes, rules, and regulations governing performance of this Contract, including but not limited to, equal opportunity employment laws, O.S.H.A., minimum wage and hour regulation, and North Carolina State Building Code regulations.
- B. E-Verify. Contractor and Engineer shall comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes. Contractor and Engineer shall also require any and all of its subrecipients to comply with the requirements of Article 2 of Chapter 64 of the North Carolina General Statutes as applicable.

18.13 *Gifts:*

- A. Pursuant to N.C. Gen. Stat. § 133-32, it is unlawful for any vendor or contractor (i.e. architect, bidder, design builder, contractor, general contractor, design professional, engineer, subcontractor, supplier, vendor, etc.), to make gifts or to give favors to any County employee. This prohibition covers those vendors and contractors who: (1) have a contract with a governmental agency; or (2) have performed under such a contract within the past year; or (3) anticipate bidding on such a contract in the future. For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review G.S. Sec. 133-32. During the construction of the Project, the Design Builder is prohibited from making gifts to any of the Owner's employees, Owner's project representatives, if any (architect, engineers, General Contractor and their employees), employees of the County that may have any involvement, influence, responsibilities, oversight, management and/or duties that pertain to and/or relate to the contract administration, financial administration and/or disposition of claims arising from and/or relating to the Contract and/or Project.

SECTION 00820

CONTRACTOR'S SALES TAX REPORT
N.C. STATE & LOCAL SALES TAXES PAID

OWNER: _____ PROJECT: _____
CONTRACTOR: _____ FOR PERIOD: _____
ADDRESS: _____ TO: _____

	MATERIAL		INVOICE		INVOICE	N.C.	COUNTY	NAME OF
<u>VENDOR</u>	<u>PURCHASE</u>	<u>ADDRESS</u>	<u>NUMBER</u>	<u>DATE</u>	<u>AMOUNT</u>	<u>TAX</u>	<u>TAX</u>	<u>COUNTY</u>

TOTAL _____

I hereby certify that for the period stated above, North Carolina sales and use taxes were paid as listed above, with respect to building materials, supplies, fixtures, and equipment which have become a part of or annexed to, a building or structure erected, altered or repaired for the County of Buncombe, and that the vendors from whom the property was purchased, the dates and numbers of the invoices covering the purchases, the total amount of the invoices of each vendor, the North Carolina sales and use taxes paid thereon, and the cost of property withdrawn from warehouse stock and North Carolina sales or use taxes paid thereon are as set forth above.

Sworn to and Subscribed before me, this _____ day of _____, 20__.

Notary

By: _____
Title: _____

My Commission Expires _____

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The work of this Contract is generally located in Buncombe County, near Alexander, North Carolina at the existing Buncombe County Solid Waste Management Facility. The work to be performed under this Contract generally includes:
 - 1. Cell 7 – Construction of a ± 13.5 -acre Subtitle D Landfill expansion complete with a composite bottom liner system, a leachate collection system, and appurtenances, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, seeding and mulching, storm drainage, and perimeter access road construction.
 - 2. Phase 7 – Construction of a ± 5.5 -acre C&D Landfill expansion, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, landfill soil base, seeding and mulching, storm drainage, and access road construction.

1.02 WORK TO BE DONE

- A. Provide all labor, materials, equipment, tools, services and incidentals necessary to complete all work required by the Contract Documents.
- B. Complete the Work, in place, tested, and ready for continuous service. Perform or provide repairs, replacements and restoration required as a result of damages resulting from construction operations.
- C. Furnish and install all materials, equipment, and incidentals which are reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Contract Documents or not.

1.03 WORK SEQUENCE

- A. Perform Work in proper sequence to ensure completion of the Work within the Contract Time and as required by Specification Sections 00500 and 01310. Completion dates of the various stages shall be in accordance with the concurred construction schedule submitted by the Contractor.
- B. SUBSTANTIAL COMPLETION: To satisfy the definition of substantial completion, the facilities shall be constructed, complete, field tested and fully operational including Owner training, subject to the Engineer's approval (reference Section 00500).
- C. READY FOR FINAL PAYMENT: The last stage of construction shall be final construction and shall include the final remaining items subject to the Engineer's approval as well as all items listed in Section 01700, Contract Closeout.

1.04 DRAWINGS AND SPECIFICATIONS FURNISHED TO THE CONTRACTOR FOR CONSTRUCTION

- A. Two (2) sets of full-size drawings and specifications shall be furnished to the Contractor for construction at no charge. Additional sets may be purchased at the cost of reproduction.

1.05 PROJECT SUBMITTALS

- A. In accordance with the Contract Documents, the Contractor shall be responsible for submitting a variety of documents, schedules and shop drawings. A list of early submittal and notification requirements and the associated Specification Sections is provided below. This list is not to be construed to include all submittals or notifications required, but is intended as a reminder of documentation required.
1. 00700 Paragraph 2.03 - Submit a Preliminary Schedule of Shop Drawings within ten (10) days after execution to the Effective Date of Agreement (EDA).
 2. 00700 Paragraph 2.03 - Submit a Preliminary Schedule of Values within ten (10) days after the EDA.
 3. 00700 Paragraph 2.03 - Submit a preliminary progress schedule within ten (10) days after EDA.
 4. 01041 Paragraph 1.12(A) - Submit Hurricane Preparedness Plan within fifteen (15) days of the date of NTP.
 5. 01050 Paragraph 1.03(A) - Submit name, address and copy of license of the Professional Land Surveyor to be used on this project to the Engineer within ten (10) days of the NTP.
 6. 01101 - Submit Site Health and Safety Plan within 7 days of starting work.
 7. 01380 Paragraph 1.03(A) - Complete and submit pre-construction photography.
 8. 01590 Paragraph 1.03(B) - Submit layout of Engineer's Field Office and product data on furnishings for Engineer's approval prior to arrival on site.
 9. 01630 Paragraph 1.04(A) - Submit, within thirty (30) days of issuance of Notice of Award (NOA), complete data as set forth to permit complete analysis of all proposed substitutions.

In addition to the early submittal and notification requirements listed above, the Contractor shall be responsible for reviewing and complying with the submittal requirements associated with each Technical Specification. Timely submission of many of these items may eliminate potential delays in the future.

1.06 SUPERINTENDENT

- A. Provide a single qualified full-time superintendent for the duration of the project. Contractor shall not change superintendent without Owner's written permission. Contractor's proposal to change personnel must be justifiable to the Owner, and must demonstrate that the proposed replacement possesses adequate qualifications.

1.07 ABBREVIATIONS AND REFERENCES

- A. Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the date of advertisement for bids, even if reference has been made to an earlier standard. Where standards, specifications or codes of the various technical societies, organizations or bodies have been referred to throughout the Specifications, the referenced standard, specification or code is hereby made a part of the Contract the same as if herein repeated in full. In the event of any conflict between any of these specifications, standards, codes or tentative specifications, and the Specifications, the latter shall govern.

- B. Reference to a technical society, organization, or body may be made in the Specifications by abbreviations, in accordance with the following list:

AASHTO	The American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AGA	American Gas Association
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWS	American Welding Society
AWWA	American Water Works Association
DIPRA	Ductile Iron Pipe Research Association
EPA	Environmental Protection Agency
FED.SPEC.	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
OSHA	Occupation Health and Safety Act
NCDOT	North Carolina Department of Transportation
NEMA	National Electrical Manufacturers Association

- C. When no reference is made to a code, standard, or specification, the standard specifications of the ASTM, the ANSI, the ASME, the IEEE, or the NEMA shall govern.

1.08 CONSTRUCTION AREAS

- A. Contractor shall limit the use of the construction areas for Work and for storage to allow for:

1. Work by other contractors.
2. Owner's use.

- B. Contractor shall coordinate use of work site.
- C. Contractor shall assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.
- D. Contractor shall move any stored Products, under Contractor's contract, which interfere with operations of the Owner or other contractors.
- E. Contractor shall obtain and pay for the use of additional storage or work areas as needed for operations.
- F. Contractor shall at all times conduct his operation as to insure the least inconvenience to the facility operations and general public.

1.09 PLANS AND SPECIFICATIONS

A. 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 detailed requirements of the work and shall always govern whenever there appears to be a conflict.

B. Intent

All work called for in the Specifications applicable to this Contract, but not shown on the Plans 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 Plans 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.

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.

The inclusion of the General Requirements (or work specified elsewhere) in the General part of the Specifications is only for the convenience of the Contractor and shall not be interpreted as a complete list of related Specification Sections.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01010

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. All contract prices included in Section 00300 will be full compensation for all labor, materials, tools, equipment and incidentals necessary to complete the Work as shown on the Drawings and specified in the Contract Documents to be performed under this Contract.
- B. The items listed below, refer to and are the same pay items listed in the Bid Form. They constitute all of the pay items for the completion of the Work. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, services, field offices, layout surveys, job signs, sanitary requirements, testing, safety devices, water supplies, power, maintaining traffic, removal of waste, watchmen, and all other requirements of the General Conditions and DIVISION 1 - GENERAL REQUIREMENTS. Compensation for all such services, equipment and materials shall be included in the prices stipulated for the lump sum and unit pay items listed herein.
- C. Each lump sum and unit bid 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.
- D. Restoration is not a separate pay item but is considered to be an integral part of the work under the contract, and all contract bid prices include the cost of restoration necessitated by the work related to that bid item. Restoration includes existing structures and property, paving, stabilized roads, drainage piping and ditches, catch basins, head walls, yard culverts, driveways, lawns and ground areas, walkways, stockpiles and irrigation systems which are altered, removed, or damaged during construction. Cleanup is an integral part of restoration.
- E. For purposes of measurement and payment, the term surface area is defined as the horizontal surface measured from a certified survey. The unit price bid for all items measured in surface area shall account for any necessary slope adjustments. The horizontal surface measurement for compacted soil liner, GCL, HDPE geomembrane, fabric cushion, and protective cover shall include the plan limits of the installed material for Cell 7, perimeter anchor berm and interim anchor berm.

1.02 PAY ITEMS

TOTAL BID - ITEMS 1 – 64

START OF PHASE 7 (C&D LANDFILL) MEASUREMENT AND PAYMENT

A. Item 1 – Clearing and Grubbing

1. **Measurement:** The number of acres cleared and grubbed which will be paid for under this Item will be the actual number of acres, or partials thereof, cleared and grubbed as measured by the survey. The area measurement for payment will be verified by the Engineer.
2. **Payment:** The unit price bid per acre for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to perform clearing and grubbing as specified herein, including but not limited to proper disposal of cleared and grubbed material. No payment will be made for any clearing and grubbing beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

B. Item 2 – Removal of Vegetation and Topsoil

1. **Measurement:** The number of acres removed of vegetation and topsoil which will be paid for under this Item will be the actual number of acres, or partials thereof, removed of vegetation and topsoil as measured by survey. The area measurement for payment will be verified by the Engineer.
2. **Payment:** The unit price bid per acre for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to perform Vegetation and Topsoil Removal as specified herein, including proper disposal of vegetation and stockpiling of topsoil. No payment will be made for any Removal of Vegetation and Topsoil beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

C. Item 3 – Excavation, Haul and Stockpile of Soil Material in Borrow Area

1. **Measurement:** The quantity of material that is excavated and stockpiled which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed after clearing and grubbing and removal of topsoil and prior to excavation and backfill, to the topographic survey performed upon the completion of excavation and backfill. The volume measurement for payment will be verified by the Engineer.
2. **Payment:** The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required for excavation and stockpiling suitable material within the project limits. Payment for the excavation shall include, but not be limited to: material testing; stockpiling of suitable material; temporary stockpile stabilization; surveying; drainage, dewatering, sheeting and bracing; test pits to verify location and depth of existing buried utilities and other facilities; conformance to all state, federal and local standards and requirements; and all other work required for or incidental to

the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items. No payment will be made for any excavation for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

D. Item 4 – Excavate, Haul and Backfill of Soil Material in Phase 7 Expansion Area

1. **Measurement:** The quantity of material that is excavated, hauled and backfilled which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed after the clearing and grubbing and removal of topsoil and prior to excavation and backfill, to the topographic survey performed upon the completion of excavation and backfill less the quantities of other pay Items. The Engineer will verify the volume measurement for payment.
2. **Payment:** The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, testing, and incidentals required for placement of fill material as shown on the Drawings and specified herein including but not limited to: surveying; excavation; hauling; construction and removal of temporary haul roads; placement and compaction of backfill materials; grading; drainage and dewatering; sheeting and bracing; test pits to verify location and depth of existing utilities and structures; conformance to all federal, state and local standards and requirements; and all other work required or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other Items in the bid form. No payment will be made for any backfill for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

E. Item 5 – Excavate Rippable Rock

1. **Measurement:** The quantity of rippable rock excavation which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed prior to rippable rock excavation to the topographic survey performed upon completion of rippable rock excavation. The volume measurement for payment will be verified by the Engineer.
2. **Payment:** The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to provide rippable rock excavation to the lines and grades as approved by the Engineer including but not limited to: proper disposal of rippable rock; replacement of rippable rock excavated below subgrade elevations with suitable compacted backfill to subgrade lines and grades as shown on the Drawings; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided for under other Items in the bid form. No payment will be made for any excavation for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

F. Item 6 – Excavate Non-Rippable Rock

1. **Measurement:** The quantity of non-rippable rock excavation which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed prior to non-rippable rock excavation to the topographic survey performed upon completion of Non-Rippable Rock Excavation. The volume measurement for payment will be verified by the Engineer.
2. **Payment:** The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to provide Non-Rippable Rock Excavation to the lines and grades as approved by the Engineer including but not limited to: proper disposal of non-rippable rock; replacement of non-rippable rock excavated below subgrade elevations with suitable compacted backfill to subgrade lines and grades as shown on the Drawings; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided for under other Items in the bid form. No payment will be made for any excavation for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

G. Item 7 – Undercut and Stockpile Unsuitable Material and Backfill Undercut Area with Suitable Soils

1. **Measurement:** The quantity of undercut and backfill of unsuitable soils to be paid for under this Item will be the number of actual cubic yards of unsuitable soils excavated below the lines and grades of the subgrade and backfilled with suitable fill material as directed by the Engineer and as measured by comparing topographic surveys performed before and after excavation of unsuitable soils and after backfill with suitable fill material. The volume will be verified by the Engineer.
2. **Payment:** The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required for the undercut and backfill of unsuitable soils below the lines and grades of the subgrade. Payment for this Item shall include, but not be limited to: surveying; excavation and proper disposal of all unsuitable materials found below the lines and grades of the subgrade; drainage, dewater, sheeting and bracing not required as part of other Items; hauling; placement and compaction of suitable fill material to the lines and grades of the subgrade; grading; and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other bid Items. No payment will be made for any undercut for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

H. Item 8 – Furnish and Install French Drain

1. Measurement: The quantity of French drain to be paid for under this Item will be the actual number of linear feet of pipe and rock in place measured horizontally along the centerline of the installed pipe.
2. Payment: The unit price bid per linear foot for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install French drain as shown on the Drawings and specified herein, including but not limited to: pipe, fittings, caps, plugs, flanges, couplings, bolts, tee sections, crosses, wye laterals, and cleanout caps; pipe markers; filter fabric; stone backfill/bedding; testing; certifying surveying; trench excavation, and backfilling; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

I. Item 9 – Furnish and Install 24-inch Crushed Stone Perimeter Access Roadway

1. Measurement: The quantity of Crushed Stone Perimeter Access Roadways to be paid for under these Items will be the actual number of square yards of crushed stone roadway constructed as measured in surface area. The surface area shall be as measured by the limits of the road survey as required in Section 01050 and approved by the Engineer.
2. Payment: The unit price bid per square yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install the crushed stone perimeter access roadways including but not limited to excavation and backfill, crushed stone, geotextile, subbase preparation and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

J. Item 10 – Furnish and Install Guardrail

1. Measurement: The quantity of metal guardrail to be paid for under this item will be the actual number of linear feet of new guardrail as measured along the horizontal centerline of the guardrail with no deduction for support posts. Measurement will be to the nearest tenth of a foot of guardrail.
2. Payment: The unit price bid per linear foot for this item shall be full compensation to furnish and install guardrail, including but not limited to: support posts; support cables and anchoring plates; installation of support posts; buffered end sections; and all other appurtenances as identified in the Drawings and as specified herein for which payment is not provided under other items in the bid form.

K. Item 11 – Furnish and Install Sediment and Erosion Control

1. The lump sum price for sediment and erosion control measures shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals necessary for furnishing and maintaining sedimentation and erosion control measures as shown in the Drawings or otherwise required for adequate control of sedimentation from the site, and specified herein, including controls for both permanent and temporary structures, facilities, stockpiles, ditches, roadways, pre-construction Sediment Pond No. 13 demucking, new Sediment Pond No. 13 skimmer, baffles and associated improvements, and Sediment Pond No. 13 demucking following site stabilization. Control measures shall include, but not be limited to, drainage ditches, diversion berms, riprap channels, stone dams, check dams, silt fences and outlets, steel culvert piping, inlet and outlet protection, downchute piping including inlets and flared end section, riprap apron, and ponds, and shall conform to all Buncombe County and NCDEQ Erosion and Sediment Control Standards and Requirements.

L. Item 12 – Furnish and Install Permanent Seeding and Mulching

1. Measurement: The number of square yards of Seeding and Mulching that will be measured for payment under this Item will be based upon the actual in-place quantity as measured by computing the area of the seeded and mulched area limits from the survey as required in Section 01050, and as accepted by the Engineer.
2. Payment: The unit price bid per square yard for this Item will be full compensation for performing seeding and mulching, the addition of soil amendments as specified herein for which payment is not provided under other Items in the bid form. No payment will be made for seeded and mulched areas until the establishment of a sufficient growth of grass as examined and approved by the Engineer and certifying surveys required by Section 01050 have been submitted and approved by the Engineer.

END OF PHASE 7 (C&D LANDFILL) MEASUREMENT AND PAYMENT

START OF CELL 7 (MSW LANDFILL) MEASUREMENT AND PAYMENT

M. Item 13 – Clearing and Grubbing

1. Measurement: The number of acres cleared and grubbed which will be paid for under this Item will be the actual number of acres, or partials thereof, cleared and grubbed as measured by the survey. The area measurement for payment will be verified by the Engineer.

2. Payment: The unit price bid per acre for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to perform clearing and grubbing as specified herein, including but not limited to proper disposal of cleared and grubbed material. No payment will be made for any clearing and grubbing beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

N. **Item 14 – Removal of Vegetation and Topsoil**

1. Measurement: The number of acres removed of vegetation and topsoil which will be paid for under this Item will be the actual number of acres, or partials thereof, removed of vegetation and topsoil as measured by survey. The area measurement for payment will be verified by the Engineer.
2. Payment: The unit price bid per acre for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to perform Vegetation and Topsoil Removal as specified herein, including proper disposal of vegetation and stockpiling of topsoil. No payment will be made for any Removal of Vegetation and Topsoil beyond the limits of construction as shown on the Drawings, or for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

O. **Item 15 – Excavation, Haul and Stockpile of Soil Material in Borrow Area**

1. Measurement: The quantity of material that is excavated and stockpiled which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed after clearing and grubbing and removal of topsoil and prior to excavation and backfill, to the topographic survey performed upon the completion of excavation and backfill. The volume measurement for payment will be verified by the Engineer.
2. Payment: The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required for excavation and stockpiling suitable material within the project limits. Payment for the excavation shall include, but not be limited to: material testing; stockpiling of suitable material; temporary stockpile stabilization; surveying; drainage, dewatering, sheeting and bracing; test pits to verify location and depth of existing buried utilities and other facilities; conformance to all state, federal and local standards and requirements; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items. No payment will be made for any excavation for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

P. **Item 16 – Excavate, Haul and Backfill of Soil Material in Cell 7, Anchor Berms and Roads**

1. Measurement: The quantity of material that is excavated, hauled and backfilled which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed after the clearing and grubbing and removal of topsoil and prior to excavation and backfill, to the topographic survey performed upon the completion of excavation and backfill less the quantities of other pay Items. The Engineer will verify the volume measurement for payment.
2. Payment: The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, testing, and incidentals required for placement of fill material as shown on the Drawings and specified herein including but not limited to: surveying; excavation; hauling; construction and removal of temporary haul roads; placement and compaction of backfill materials; grading; drainage and dewatering; sheeting and bracing; test pits to verify location and depth of existing utilities and structures; conformance to all federal, state and local standards and requirements; and all other work required or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other Items in the bid form. No payment will be made for any backfill for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

Q. Item 17 – Excavate Rippable Rock

1. Measurement: The quantity of rippable rock excavation which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed prior to rippable rock excavation to the topographic survey performed upon completion of rippable rock excavation. The volume measurement for payment will be verified by the Engineer.
2. Payment: The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to provide rippable rock excavation to the lines and grades as approved by the Engineer including but not limited to: proper disposal of rippable rock; replacement of rippable rock excavated below subgrade elevations with suitable compacted backfill to subgrade lines and grades as shown on the Drawings; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided for under other Items in the bid form. No payment will be made for any excavation for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

R. Item 18 – Excavate Non-Rippable Rock

1. Measurement: The quantity of non-rippable rock excavation which will be paid for under this Item will be the actual number of cubic yards measured by comparing the topographic survey performed prior to non-rippable rock excavation to the topographic survey performed upon completion of Non-Rippable Rock Excavation. The volume measurement for payment will be verified by the Engineer.

2. Payment: The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to provide Non-Rippable Rock Excavation to the lines and grades as approved by the Engineer including but not limited to: proper disposal of non-rippable rock; replacement of non-rippable rock excavated below subgrade elevations with suitable compacted backfill to subgrade lines and grades as shown on the Drawings; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided for under other Items in the bid form. No payment will be made for any excavation for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

S. **Item 19 – Undercut and Stockpile Unsuitable Material and Backfill Undercut Area with Suitable Soils**

1. Measurement: The quantity of undercut and backfill of unsuitable soils to be paid for under this Item will be the number of actual cubic yards of unsuitable soils excavated below the lines and grades of the subgrade and backfilled with suitable fill material as directed by the Engineer and as measured by comparing topographic surveys performed before and after excavation of unsuitable soils and after backfill with suitable fill material. The volume will be verified by the Engineer.
2. Payment: The unit price bid per cubic yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required for the undercut and backfill of unsuitable soils below the lines and grades of the subgrade. Payment for this Item shall include, but not be limited to: surveying; excavation and proper disposal of all unsuitable materials found below the lines and grades of the subgrade; drainage, dewater, sheeting and bracing not required as part of other Items; hauling; placement and compaction of suitable fill material to the lines and grades of the subgrade; grading; and all other work required for or incidental to the satisfactory completion of all Work under this contract for which payment is not provided under other bid Items. No payment will be made for any undercut for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer

T. **Item 20 – Furnish and Install French Drain**

1. Measurement: The quantity of French drain to be paid for under this Item will be the actual number of linear feet of pipe and rock in place measured horizontally along the centerline of the installed pipe.
2. Payment: The unit price bid per linear foot for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install French drain as shown on the Drawings and specified herein, including but not limited to: pipe, fittings, caps, plugs, flanges, couplings, bolts, tee sections, crosses, wye laterals, and cleanout caps; pipe markers;

filter fabric; stone backfill/bedding; testing; certifying surveying; trench excavation, and backfilling; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

U. **Item 21** – Furnish and Install 18-inch Compacted Soil Liner Material

1. Measurement: The quantity of 18-inch compacted soil material to be paid for under this Item will be the actual number of square yards of compacted soil material in-place measured in surface area excluding the area for the clay plug.
2. Payment: The unit price bid per square yard of compacted soil material will be full compensation for all labor, materials, tools, equipment, certifying surveying, testing, supervision and incidentals required to perform all work required to complete the installation of the compacted soil liner material as shown on the Drawings and specified herein including but not limited to: clearing and grubbing of potential borrow source(s); borrow pit restoration; clay plug installation; excavation; hauling from on-site borrow source(s); placement, compaction and grading of compacted soil liner material; haul road construction and removal; protection of stockpiled and installed material; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items. Payment will only be made for areas, which have reached the required minimum thickness of 18-inches as certified by a North Carolina Professional Land Surveyor and verified by the Engineer and for which satisfactory conformance and hydraulic conductivity testing results have been obtained. No payment will be made for any compacted soil liner material until certifying surveys required by Section 01050 have been submitted and approved by the Engineer.

V. **Item 22** – Furnish and Install Geosynthetic Clay Liner (GCL)

1. Measurement: The quantity of GCL to be paid for under this Item will be the actual number of square yards of GCL in place as measured in surface area.
2. Payment: The unit price bid per square yard of GCL will be full compensation for all labor, materials, tools, equipment, certifying surveying, testing equipment, supervision and incidentals required to furnish and install the GCL (excluding seam overlap) as shown on the Drawings and specified herein including but not limited to: QC testing, protection of stockpiled and installed material; sandbags; anchor trench and interim anchor trench material; and excavation and backfill of anchor trench. No payment will be made for any GCL liner areas for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

W. **Item 23** – Furnish and Install HDPE Geomembrane

1. Measurement: The quantity of 60-mil. textured HDPE geomembrane which will be paid for under this Item will be the actual number of square yards of 60-mil. textured

HDPE geomembrane in place as measured in surface area excluding seam overlaps, vertical liner placement within perimeter anchor trench and folded liner material within the interim anchor berm.

2. Payment: The unit price bid per square yard for this Item will be full compensation for all labor, materials, tools, equipment, certifying surveying, QC testing, equipment, supervision, and incidentals required to furnish and install 60-mil. textured HDPE Geomembrane as shown on the Drawings and specified herein including but not limited to protection of stockpiled and installed material, sandbags, anchor trench and interim anchor trench material and excavation and backfill of anchor trench. No payment will be made for any HDPE liner areas for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

X. Item 24 – Furnish and Install Fabric Cushion

1. Measurement: The quantity of fabric cushion to be paid for under this Item will be the actual number of square yards of fabric cushion in place as measured in surface area excluding seam overlaps, vertical liner placement within perimeter anchor trench, and folded liner within the interim anchor trench.
2. Payment: The unit price bid per square yard for this Item will be full compensation for providing all labor, materials, tools, equipment, supervision, certifying surveying, QC testing, and incidentals required to perform all work required to complete the installation of the fabric cushion (excluding seam overlap) as shown on the Drawings and specified herein including but not limited to protection of stockpiled and installed material, sandbags, anchor trench and interim anchor trench material and excavation and backfill of anchor trench. No payment will be made for any fabric cushion until certifying surveys required by Section 01050 have been submitted and approved by the Engineer.

Y. Item 25 – Furnish and Install Cells 6 and 7 Liner System Connection

1. Measurement: The quantity of liner system connection to be paid for under this item will be the actual number of linear feet of liner system connection in place measured horizontally along the centerline of the liner system connection.
2. Payment: The unit price bids per linear foot for this item will be full compensation for the liner system connection as shown on the Drawings and specified herein, including but not limited to: all work to expose and maintain the existing Cell 6 liner system; and all else incidental to the work for which payment is not provided under other items in the bid form. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

Z. Item 26 – Furnish and Install 24-Inch Thick Rock Protective Cover Layer

1. Measurement: The quantity of rock for the 24-inch thick minimum Protective Cover Rock Layer which will be paid for under this Item will be the actual number of square yards of rock in place as measured in surface area.
2. Payment: The unit price bid per square yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to perform all work required to complete the installation of the Protective Cover Rock Layer as shown on the Drawings and specified herein, including, but not limited to hauling, placing and compacting, surveying, QC testing, and protection of stockpiled material. Payment will only be made for areas which have reached the required minimum thickness of 24-inches as certified by a North Carolina Professional Land Surveyor and verified by the Engineer, and for which satisfactory conformance test results have been obtained. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

AA. Item 27 – Haul and Install 24-Inch Thick Rock Protective Cover Layer

1. Measurement: The quantity of rock for the 24-inch thick minimum Protective Cover Rock Layer which will be paid for under this Item will be the actual number of square yards of rock hauled from the on-site stockpile and placed as measured in surface area.
2. Payment: The unit price bid per square yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to perform all work required to complete the installation of the Protective Cover Rock Layer as shown on the Drawings and specified herein, including, but not limited to hauling, placing and compacting, surveying, QC testing, and protection of stockpiled material. Payment will only be made for areas which have reached the required minimum thickness of 24-inches as certified by a North Carolina Professional Land Surveyor and verified by the Engineer, and for which satisfactory conformance test results have been obtained. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

AB. Items 28 through 34 – Furnish and Install HDPE Pipes

1. Measurement: The quantity of various diameters, function (gravity, force main and vacuum), and type (solid and perforated) of HDPE Pipes to be paid for under these Items will be the actual number of linear feet of pipe in place measured horizontally along the centerline of the installed pipes.
2. Payment: The unit price bid per linear foot for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install designated pipe as shown on the Drawings and specified herein, including but not limited to: pipe, fittings, caps, plugs, connection to pumps, flanges, couplings, bolts, tee sections, saddles; crosses, wye

laterals, and cleanout caps; cleanout pads; concrete bin blocks; identification labels; pipe markings; pipe supports; filter fabric; crushed stone bedding; testing; trench excavation, soil or aggregate backfilling; internal fusion bead trimming; stub outs; cleanouts; air release valve and vault; valves; wellheads; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items. No payment will be made for areas in which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

AC. Item 35 – Furnish and Install Condensate Recovery System

1. The lump sum price for the condensate recovery system shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish and install the condensate recovery system as shown on the Drawings and as specified herein including, but not be limited to: complete automated condensate recovery system with HDPE sump and internal pipe, pneumatic pump, valves, fittings, connections, HDPE air line; HDPE condensate return line; excavation and backfill; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AD. Item 36 – Furnish and Install Submersible Leachate Pump Station (Complete) with all Appurtenances

1. Payment: The lump sum price bid for Submersible Leachate Pump Station and all appurtenances will be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish and install the submersible pump station as shown on the Drawings and as specified herein including but not limited to the pump and spare pump; solid HDPE piping, eccentric reducers, couplings, pipe bends, connections, HDPE tees and bolted HDPE blind flange; check valves, gate valves, and air release valves and support; concrete pad with pipe supports; concrete bin blocks; flow meter; PVC flexible discharge pipe; PVC sample line; pre-cast concrete valve vaults with hinged cover; breakout boxes; aluminum ramp; pump control panel; wiring to the indicator/transmitter; concrete pad and mounting assembly; transmitter installation; electrical wiring conduit and pull boxes; conformance to all federal, state and local requirements and standards; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AE. Item 37 – Remove, Replace and Improve Existing Cells 1 through 6 Leachate Pump Stations

1. Measurement: The unit quantity price bid for this Item will be based on the number of leachate pump stations that are improved and accepted by the Engineer.
2. Payment: The unit price for removing, replacing and improving existing leachate pump station areas shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to complete the work as shown in the

Drawings and as specified herein for which payment is not provided under other Items in the bid form. Installation shall include but not be limited to removing and installing new ARVs with discharge hoses, removing and installing new pre-cast concrete valve vaults with hinged covers, new HDPE piping, check valves, sampling line and port, heat tracing and insulating piping, and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AF. Item 38 – Furnish and Install Groundwater Monitoring System (Complete)

1. The lump sum price bid for the Groundwater Monitoring System and all appurtenances will be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish, install and test the groundwater monitoring system (completed) as shown on the Drawings and as specified herein including but not limited to: the HDPE piping, caps, and tees; bootless pipe penetrations; 60-mil. HDPE geomembrane; GCL; fabric cushion; geocomposite drainage net; filter fabric; NCDOT stone; compacted fill; grout; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AG. Items 39 through 42 – Jet Clean and Video Camera Inspect HDPE Piping

1. Measurement: The quantity of jet cleaning and video inspection to be paid for under these Items will be the actual number of linear feet of new and existing HDPE pipes jet cleaned and video camera inspected as measured horizontally along the centerline of the pipes.
2. Payment: The unit price bid per linear foot for the subdivisions of these Items shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish all jet cleaning and video camera inspecting of existing and new HDPE pipes including but not limited to: water supply; debris pumping and removal; access; explosion proof video inspection equipment; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AH. Item 43 – Furnish and Install Drop Inlet Structures (Complete)

1. Measurement: The unit quantity price bid for this Item will be based on the number of drop inlet structures furnished and installed and accepted by the Engineer.
2. Payment: The unit price for the drop inlet structures will be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish and install the Drop Inlet Structures as shown on the Drawings and specified herein including but not limited to excavation, backfill, pre-cast concrete box, pre-cast concrete manhole sections, grates, manhole steps, RCP connections, grout, NCDOT No. 78M stone, filter fabric, and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AI. Item 44 – Furnish and Install Concrete Stilling Structure (Complete)

1. The lump sum price for the concrete stilling structure and appurtenances will be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish and install the Concrete Stilling Structure including but not limited to grading, excavation and backfill, foundation stone, 4-inch corrugated perforated and solid plastic pipe, filter fabric, pre-cast concrete stilling structure, galvanized steel bar outlet protection, NCDOT Class 2 riprap, flexible pipe sleeves, non-shrink grout, and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AJ. Item 45 – Furnish and Install 24-inch Reinforced Concrete Pipe (RCP)

1. Measurement: The quantity of RCP to be paid for under this Item will be the actual number of linear feet of RCP pipe in place measured horizontally along the centerline of the installed pipe.
2. Payment: The unit price bid per linear foot for this Item will be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish and install the RCP pipe as shown on the Drawings and specified herein, including but not limited to pipe, fittings, gaskets, trench excavation, pipe bedding, filter fabric, structural fill and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AK. Item 46 – Furnish and Install 12-inch Crushed Stone Perimeter Access Roadway

1. Measurement: The quantity of Crushed Stone Perimeter Access Roadways to be paid for under these Items will be the actual number of square yards of crushed stone roadway constructed as measured in surface area. The surface area shall be as measured by the limits of the road survey as required in Section 01050 and approved by the Engineer.
2. Payment: The unit price bid per square yard for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install the crushed stone perimeter access roadways including but not limited to excavation and backfill, crushed stone, geotextile, subbase preparation and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AL. Item 47 – Furnish and Install Asphalt Paved Access Road

1. Measurement: The quantity of Asphalt Paved Access Road to be paid for under these Items will be the actual number of square yards of asphalt paved access road constructed as measured in surface area. The surface area shall be as measured by

the limits of the road survey as required in Section 01050 and approved by the Engineer.

2. Payment: The unit price per square yard for this Item shall be full compensation for all labor, materials, tools, equipment, supervision, and incidentals required to furnish and install asphalt pavement including but not limited to subgrade preparation, geotextile, aggregate base course, intermediate and surface courses placement and compaction, and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items and all else incidental thereto for which separate payment is not provided under other Items in the Bid Form. No payment will be made for any asphalt for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

AM. Item 48 – Remove Existing Crushed Stone Surface and Furnish and Install Asphalt Paved Access Road

1. Measurement: The quantity of remove existing crushed stone surface and install asphalt paved access road to be paid for under these Items will be the actual number of square yards of asphalt paved access road constructed as measured in surface area. The surface area shall be as measured by the limits of the road survey as required in Section 01050 and approved by the Engineer.
2. Payment: The unit price per square yard for this Item shall be full compensation for all labor, materials, tools, equipment, supervision, and incidentals required to remove the existing crushed stone surface and furnish and install asphalt pavement including but not limited to stone removal, subgrade preparation, geotextile, aggregate base course, intermediate and surface courses placement and compaction, and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items and all else incidental thereto for which separate payment is not provided under other Items in the Bid Form. No payment will be made for any asphalt for which certifying surveys required by Section 01050 have not been submitted and approved by the Engineer.

AN. Item 49 – Furnish and Install Guardrail

1. Measurement: The quantity of metal guardrail to be paid for under this item will be the actual number of linear feet of new guardrail as measured along the horizontal centerline of the guardrail with no deduction for support posts. Measurement will be to the nearest tenth of a foot of guardrail.
2. Payment: The unit price bid per linear foot for this item shall be full compensation to furnish and install guardrail, including but not limited to: support posts; support cables and anchoring plates; installation of support posts; buffered end sections; and all other appurtenances as identified in the Drawings and as specified herein for which payment is not provided under other items in the bid form.

AO. Item 50 – Furnish and Install Landfill Access Ramp

1. The lump sum price for the landfill access ramp shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to furnish and install the access ramps as shown in the Drawings and as specified herein for which payment is not provided under other Items in the bid form. Installation shall include but not be limited to plywood, structural fill, geogrid, aggregate base course and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AP. Item 51 – Furnish and Install Riprap Lined Drainage Channel

1. Measurement: The quantity of the riprap lined drainage channel to be paid under this Item will be the number of linear feet of channel in-place measured horizontally along the centerline of the channel.
2. Payment: The unit price bid per linear foot for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install the riprap lined drainage channel as shown on the Drawings and specified herein, including but not limited to: grading; riprap; hauling; filter fabric and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AQ. Item 52 – Re-establish Riprap Lined Drainage Channel

1. Measurement: The quantity of the re-established riprap lined drainage channel to be paid under this Item will be the number of linear feet of channel in-place measured horizontally along the centerline of the channel.
2. Payment: The unit price bid per linear foot for this Item will be full compensation for all labor, materials, tools, equipment, supervision, certifying survey, and incidentals required to furnish and install the riprap lined drainage channel as shown on the Drawings and specified herein, including but not limited to: excavation and hauling of soil material; grading; riprap; hauling; filter fabric and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AR. Item 53 – Furnish and Install Sediment and Erosion Control

1. The lump sum price for sediment and erosion control measures shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals necessary for furnishing and maintaining sedimentation and erosion control measures as shown in the Drawings or otherwise required for adequate control of sedimentation from the site, and specified herein, including controls for both permanent and temporary structures, facilities, stockpiles, ditches, roadways. Control measures shall include, but not be limited to, construction entrance/exit, drainage ditches, Sediment Pond No. 2, sediment traps, diversion berms, check dams, silt fences and outlets, inlet and outlet protection, and riprap aprons, and shall conform to

all Buncombe County and NCDEQ Erosion and Sediment Control Standards and Requirements.

AS. **Item 54** – Furnish and Install Stormwater Diversion Berms for Cell 6 Runoff

1. Measurement: The quantity of the Stormwater Diversion Berms to be paid under this item will be the number of linear feet of berms and piping on the Cell 6 side slope in-place measured horizontally along the centerline of the berms and piping.
2. Payment: The unit price bid per linear foot for this item shall be full compensation for furnishing and installing the diversion berms and downchute piping as shown on the Drawings and specified herein, including but not limited to: grading; compaction; riprap; geotextile; CPP flared end sections; CPP pipe and fittings; riprap outlet protection; erosion control matting; seeding and mulching; maintenance; and all else incidental to the work for which payment is not provided under other items in the bid form.

AT. **Item 55** – Furnish and Install Cell 7 Stormwater Segregation System

1. Payment: The lump sum price for the stormwater segregation system shall be full compensation for all labor, materials, tools, equipment, supervision, and incidentals necessary for furnishing and installing the stormwater segregation system as shown in the Drawings and specified herein including but not limited to: stormwater berm aggregate; stormwater tarp; submersible pump and appurtenances; HDPE piping, fittings, and blind flange; fabric cushion; NCDOT washed stone; sand bags and rope; electrical wiring conduit and pull boxes; conformance to all federal, state and local requirements and standards; and all other work required for or incidental to the satisfactory completion of all Work under this Contract for which payment is not provided under other bid Items.

AU. **Item 56** – Furnish and Install Temporary Seeding and Mulching

1. Measurement: The number of square yards of Temporary Seeding and Mulching that will be measured for payment under this Item will be based upon the actual in-place quantity as measured by computing the area of the temporary seeded and mulched area limits from the survey as required in Section 01050, and as accepted by the Engineer.
2. Payment: The unit price bid per square yard for this Item will be full compensation for performing Temporary Seeding and Mulching, the addition of soil amendments as specified herein for which payment is not provided under other Items in the bid form. Temporary Seeding and Mulching shall only be conducted when permanent seeding and mulching cannot be performed due to seasonal constraints and upon approval by the Engineer. No payment will be made for temporary seeded and mulched areas until the establishment of a sufficient growth of grass as examined and approved by the Engineer and certifying surveys required by Section 01050 have been submitted and approved by the Engineer.

AV. **Item 57** – Furnish and Install Permanent Seeding and Mulching

1. **Measurement:** The number of square yards of Seeding and Mulching that will be measured for payment under this Item will be based upon the actual in-place quantity as measured by computing the area of the seeded and mulched area limits from the survey as required in Section 01050, and as accepted by the Engineer.
2. **Payment:** The unit price bid per square yard for this Item will be full compensation for performing seeding and mulching, the addition of soil amendments as specified herein for which payment is not provided under other Items in the bid form. No payment will be made for seeded and mulched areas until the establishment of a sufficient growth of grass as examined and approved by the Engineer and certifying surveys required by Section 01050 have been submitted and approved by the Engineer.

AW. Item 58 – Furnish and Install all Electrical Connection and Appurtenances

1. The lump sum price for Electrical Connections and Appurtenances shall be full compensation for all labor, materials, tools, equipment, supervision, and incidentals required to furnish and install all Electrical Connections and Appurtenances including, but not limited to, power supply conduit, cable and equipment, pull boxes, transformers, grounding systems, control panels, testing, and all other appurtenances as identified in the Drawings and as specified herein for which payment is not provided under other Items in the bid form.

AX. Item 59 – Complete Geomembrane Leak Location Survey

1. The lump sum price for the geomembrane leak location survey shall be full compensation for all labor, materials, tools, equipment, supervision and incidentals required to provide the leak location survey as specified in the material specifications. The lump sum price shall include but not be limited to site preparation, coordination, water supply, reporting, excavation of damage, repairs, and re-surveys of repaired areas until survey indicates no damages.

AY. Item 60 – Miscellaneous Work and Clean-up

1. The lump sum price for Miscellaneous Work and Clean-up shall be full compensation for all labor, materials, and equipment required to perform the work specified in Section 02901 of the Specifications and as shown on the Drawings, and any other work not specifically included for payment under any other Item but obviously necessary to complete the Contract. Partial payments will be based on the breakdown of the Item as required in Section 02901. The lump sum price shall include, but not limited to, full compensation for Construction Schedules as required by Section 01310, all construction photography as required by Section 01380, pre-construction photography as required by Section 01390, project record documents as required by Section 01720, Operation and Maintenance manuals as required by Section 01730, traffic control, liner limits posts and other markers, forcemain location posts, seeding of unused stockpile areas, bollards and Quality Control Laboratory (QCL) testing.

AZ. Item 61 – Mobilization and Demobilization

1. Measurement for this Item will be based on an allowance for mobilization/demobilization.
2. Payment of this Item will be made at the applicable lump sum amount, as above determined, and will represent full compensation for mobilization/demobilization in accordance with the requirements of the General Conditions.
Mobilization/demobilization payments will be pro-rated on a monthly basis.

BA. Items 62 and 64 – Contingency Allowance

1. The contingency allowance is to provide payment for unforeseen conditions which may be encountered in the work and is to be used only upon written work order from the Engineer. The contingency allowance shall be a fixed percentage of the base bid as specified in the Bid Form.

The contingency allowance is not part of the Unit Price Contract and is not due to the Contractor except when authorized by a change order executed by the Owner as set forth in the General Conditions.

BB. Item 63 – Furnish and Install Fabric-filled Concrete Lined Drainage Channel

1. Measurement: The quantity of the Fabric-filled Concrete Lined Drainage Channel to be paid for under this item will be the number of linear feet of channel in-place measured horizontally along the centerline of the channel.
2. Payment: The unit price bid per linear foot for this item shall be full compensation for installation of fabric-filled concrete lined drainage channel as shown on the Drawings and specified herein, including but not limited to: excavate; transport; and stockpile excess and unsuitable materials; installing backfill; compacting; surface preparation; furnishing and installing fabric formwork and concrete; anchoring; and all else incidental thereto for which payment is not provided under other items in the bid form.

END OF SECTION 01025

SECTION 01026
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit to the Engineer a Schedule of Values allocated to the various portions of the work as listed in the Bid Form (Section 00300) within 21 days after the effective date of the Agreement.
- B. Upon request of the Engineer, support the values with data which will substantiate their correctness.
- C. The accepted Schedule of Values shall be used only as the basis for the Contractor's Applications for Payment.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents include, but are not limited to the following related requirements:
 - 1. Section 00300: Bid Form
 - 2. Section 00700: General Conditions
 - 3. Section 01027: Applications for Payment

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Type schedule on an 8-1/2-inch by 14-inch white paper. Identify schedule with:
 - 1. Title of Project and location.
 - 2. Engineer and Project number.
 - 3. Name and Address of Contractor.
 - 4. Contract designation.
 - 5. 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 values for progress payments during construction. At a minimum the component parts listed in the bid form shall be used.
- C. Identify each line item with the number and title of the respective major section of the specifications.
- D. For each major line item list sub-values of major products or operations under the 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. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by the Engineer.
 - b. The total installed value.

F. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.04 SUBSCHEDULE OF UNIT MATERIAL VALUES

A. Submit a sub-schedule of unit costs and quantities for:

1. Products on which progress payments will be requested for stored products.

B. The 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. The unit quantity for bulk materials shall include an allowance for normal waste.

D. The unit values for the materials shall be broken down into:

1. Cost of the material, delivered and unloaded at the site, with taxes paid.
2. Copies of invoices for component material shall be included with the payment request in which the material first appears.
3. Paid invoices shall be provided with the second payment request in which the material appears or no payment shall be allowed and/or may be deleted from the request.

E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01026

SECTION 01027

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Applications for Payment to the Engineer in accordance with the schedule established by Conditions of the Contract and Agreement Between Owner and Contractor.
- B. The accepted Schedule of Values, Section 01026, shall be used as the basis for the Contractor's Application for Payment.

1.02 RELATED WORK

- A. Section 00700: General Conditions
- B. Section 01025: Measurement and Payment
- C. Section 01026: Schedule of Values
- D. Section 01036: Change Order Procedures
- E. Section 01050: Field Engineering
- F. Section 01380: Construction Photographs
- G. Section 01700: Contract Closeout
- H. Section 01720: Project Record Documents

1.03 SUBMITTALS

- A. Submit Applications for Payment in automated format approved by the Engineer, with itemized data typed on 8-1/2-in by 11-in or 8-1/2-in by 14-in white paper continuation sheets. Applications for Payment can be in the EJCDC No. C-620 format.

With each submittal, the Contractor shall submit a spreadsheet set up in the same format as the Schedule of Values (Section 01026) providing complete documentation of all items for which payments is requested. Text and tabular data shall be in Microsoft Excel latest version.

- B. Provide itemized data on continuation sheet:
 - 1. Format, schedules, line items and values: Those of the Schedule of Values accepted by the Engineer.

- C. Provide construction photographs in accordance with Section 01380.
- D. Provide Sales Tax Report on form provided in Section 00820. This report shall include a list of sales tax paid during one pay period lagging the period described in the application for payment.

1.04 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 Contract firm.

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.
 - a. 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.
 - a. 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.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. Contractor shall submit with each application for payment the following information:

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.
 - c. Documentary evidence establishing Owner's title to such materials.
 - d. Evidence that the stored materials are insured against loss and damage.
- B. Submit one copy of data and cover letter for each copy of application.
- C. As a prerequisite for payment, Contractor is to submit a "Surety Acknowledgment of Payment Request" letter showing amount of progress payment which the Contractor is requesting.
- D. The Contractor is to maintain an updated (AutoCAD) 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 and submit for review the updated record drawings for review by the Owner and the Engineer.
- E. The Contractor shall maintain an updated construction schedule in accordance with Section 01310. As a prerequisite for monthly progress payments, Contractor shall submit the updated construction schedule with the applications for progress payments. If the Contractor fails to submit the required updated schedule within the time prescribed, the Engineer may withhold approval of progress payment estimates until such time as the Contractor submits the required updated schedule. Submit one copy for each copy of application.
- F. The Contractor shall demonstrate, as a prerequisite for monthly progress payments, compliance with all requirements specified in Section 02276 to the Engineer. If the Contractor fails to demonstrate compliance with Section 02276, the Engineer reserves the right to withhold approval of progress payment estimates until such time as the Contractor demonstrates to the Engineer full compliance with the approved erosion and sedimentation control permit and Section 02276.
- G. The Contractor shall provide, as a prerequisite for monthly progress payments, an accumulating cost curve (tabular and diagram) indicating schedule, forecast and actual progress.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application form as specified for progress payments.
- B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700 - Contract Closeout.
- C. Submit all Project Record Documents in accordance with Sections 01050 and 01720.

1.07 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to the Engineer at the times stipulated in the Agreement.
- B. Number: Four copies of each Application. One (1) will be returned to the Contractor.
- C. When the Engineer finds Application properly completed and correct, he/she will transmit certificate for payment to Owner, with copy to Contractor.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01027

SECTION 01036
CHANGE ORDER PROCEDURES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Promptly implement change order procedures.
 - 1. Provide full written data required to evaluate changes.
 - 2. Maintain detailed records of work done on a time-and-material/force account basis.
 - 3. Provide full documentation to Engineer on request.
- B. Designate in writing the member of Contractor's organization:
 - 1. Who is authorized to accept changes in the Work.
 - 2. Who is responsible for informing others in the Contractor's employ of the authorization of changes in the Work.

1.02 RELATED REQUIREMENTS

- A. Section 00500: Agreement
- B. Section 00700: General Conditions
- C. Section 01026: Schedule of Values
- D. Section 01027: Application for Payment
- E. Section 01310: Progress Schedules
- F. Section 01630: Product Options and Substitutions
- G. Section 01720: Project Record Documents

1.03 DEFINITIONS

- A. Change Order: See Section 00700.
- B. Work Change Directive: A written order to the Contractor, signed by Owner and Engineer, which amends the Contract Documents as described, and authorizes Contractor to proceed with a change which affects the Contract Sum or the Contract Time, for inclusion in a subsequent Change Order.

- C. Field Order: A written order to the Contractor, signed by the Owner, Engineer and the Contractor, which is issued to interpret/clarify the Contract Documents, order minor changes in the work and/or memorialize trade-off agreements. The work described by a Field Order is to be accomplished without change to the Contract Price, Contract Time, and/or claims for other costs.

1.04 PRELIMINARY PROCEDURES

- A. Owner or Engineer may initiate changes by submitting a Request for Proposal (RFP) to Contractor. Request will include:
 - 1. Detailed description of the Change, Products, and location of the change in the Project.
 - 2. Supplementary or revised Drawings and Specifications.
 - 3. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not, authorized.
 - 4. A specific period of time during which the requested price will be considered valid.
 - 5. Such request is for information only, and is not an instruction to execute the changes, nor to stop work in progress.
- B. Contractor may initiate changes by submitting a written notice to Engineer, containing:
 - 1. Description of the proposed changes.
 - 2. Statement of the reason for making the changes.
 - 3. Statement of the effect on the Contract Sum and the Contract Time.
 - 4. Statement of the effect on the work of separate contractors.
 - 5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.05 WORK CHANGE DIRECTIVE (WCD)

- A. In lieu of a Request for Proposal (RFP), Engineer may issue a Work Change Directive (WCD) for Contractor to proceed with a change for subsequent inclusion in a Change Order.
- B. Each WCD will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change, and will designate the method of determining any change in the Contract Sum and any change in Contract Time.
- C. Owner and Engineer will sign and date the WCD as authorization for the Contractor to proceed with the changes.
- D. Contractor will sign and date the WCD to indicate agreement with the terms therein.

1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Engineer to evaluate the quotation.
- B. On request, provide additional data to support time and cost computations.
 - 1. Labor required.
 - 2. Equipment required.
 - 3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 - 4. Taxes, insurance and bonds.
 - 5. Credit for work deleted from Contract, similarly documented.
 - 6. Overhead and profit.
 - 7. Justification for any change in Contract Time.
- C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus additional information.
 - 1. Name of the Owner's authorized agent who ordered the work, and date of the order.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time record, summary of hours worked, and hourly rates paid.
 - 4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.
- D. Document requests for substitutions for Products as specified in Section 01630.

1.07 PREPARATION OF CHANGE ORDERS AND FIELD ORDERS

- A. Engineer will prepare each Change Order and Field Order.

- B. Forms: Typical EJCDC forms may be used.
- C. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.
- E. Field Order will describe interpretations or clarifications of Contract Documents, order minor changes in the Work, and/or memorialize trade-off agreements.
- F. Field Order work will be accomplished without change in the Contract Sum, Contract Time, and/or claims for other costs.

1.08 LUMP-SUM/FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer's Proposal Request and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
 - 2. Contractor's Proposal for a change, as recommended by Engineer.
- B. Owner and Engineer will sign and date the Change Order as authorization for the Contractor to proceed with the changes.
- C. Contractor will sign and date the Change Order to indicate agreement with the terms therein.

1.09 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer's definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as recommended by Engineer.
 - 3. Survey of completed work.
- B. The amounts of the unit prices to be:
 - 1. Those stated in the Bid Form.
 - 2. The unit prices stated in the Bid Form shall be utilized for all change orders and shall represent the total cost, including overhead and profit.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:

1. Owner and Engineer will sign and date the Change Order as authorization for Contractor to proceed with the changes.
2. Contractor will sign and date the Change Order to indicate agreement with the terms therein.

D. When quantities of the items cannot be determined prior to start of the work:

1. Engineer or Owner may issue a WCD directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
2. At completion of the change, Engineer will determine the cost of such work based on the unit prices and quantities used.
 - a. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
3. Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
4. Owner and Contractor will sign and date the Change Order to indicate their agreement with the terms therein.

1.10 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/WORK CHANGE DIRECTIVE

- A. Engineer and Owner will issue a WCD directing Contractor to proceed with the changes.
- B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this Section.
- C. Engineer will determine the allowable cost of such work, as provided in General Conditions and Supplementary Conditions.
- D. Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
- E. Owner and Contractor will sign and date the Change Order to indicate their agreement therewith.

1.11 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
 1. Revise subschedules to show changes for other items of work affected by the changes.

C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01036

SECTION 01041

PROJECT COORDINATION

PART 1 GENERAL

1.01 GENERAL

- A. The work to be performed under this Contract generally includes:
 - 1. Cell 7 – Construction of a ±13.5-acre Subtitle D Landfill expansion complete with a composite bottom liner system, a leachate collection system, and appurtenances, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, seeding and mulching, storm drainage, and perimeter access road construction.
 - 2. Phase 7 – Construction of a ±5.5-acre C&D Landfill expansion, including but not limited to clearing and grubbing, erosion and sediment control, excavation and backfill, landfill soil base, seeding and mulching, storm drainage, and access road construction.
- B. The Work under this Contract involves expanding an existing Subtitle D lined landfill and existing C&D landfill. The Owner is conducting daily disposal operations. The Contractor will be required to submit to the Engineer and Owner a traffic control plan for review. The traffic control plan shall indicate how the Contractor intends to direct and monitor construction traffic such that landfill operations are not impacted. The traffic control plan shall demonstrate that (1) all landfill user vehicles and landfill operator vehicles will intersect construction equipment only at points where the Contractor provides a flagman to control and direct traffic; and (2) landfill user vehicles and landfill operator vehicles will not be delayed at these intersections for a period which exceeds one (1) minute.
- C. During earthwork at the C&D Landfill, Phase 7, the Owner may elect to require specific work hours and/or days as to not interfere with landfill operations.
- D. If rock is encountered in the C&D Landfill, Phase 7 or Subtitle D Landfill, Cell 7, Contractor shall immediately notify the Engineer. The Owner may elect to require specific rock removal hours and/or days depending on location of rock as to not interfere with operations.
- E. Carefully coordinate and conduct all work in strict accordance with federal, state, and county requirements and standards.
- F. The Contractor shall be aware that there is the potential for methane gas to be present within the existing leachate piping. Proper Health and Safety procedures should be implemented prior performing any welding operations for connecting the new leachate header line to the existing header line. Other potential on-site hazards include contact with landfill leachate, ongoing landfill operations and potential contact with municipal solid waste during liner tie-in operations.

1.02 LINES AND GRADES

- A. The Contractor shall be responsible for establishing all lines and measurements necessary for the proper execution and control of the work. Available horizontal and vertical controls are shown on the Drawings. Any deviation from the proposed grading or stockpile area as shown on the Drawings shall be prohibited without approval from the Engineer and Owner.
- B. Metal grade stakes shall be used within the compacted soil liner material limits during installation. The stakes shall be numbered prior to the beginning of the clay liner or compacted soil liner material installation and shall be inventoried and accounted for by the Contractor following completion of the compacted soil liner material. No PVC or other hollow grade stakes shall be used within the compacted soil liner material.

1.03 ACCESS AND DRAINAGE

- A. The Contractor shall provide and maintain adequate access to and throughout the site and shall keep all natural drainage and water courses unobstructed or provide equal courses effectively placed. The Contractor shall maintain drainage facilities to prevent accumulation of surface water. The Owner assumes no responsibility for the placement, condition or maintenance of any access roads or structures that may be used by the Contractor in the performance of his work.
- B. The Contractor shall add diversion measures deemed necessary to prevent stormwater runoff from the existing landfill area from impacting the construction. Contractor shall coordinate such efforts with the Owner's operations. Contractor shall also maintain any stormwater diversion measures in accordance with Section 02276.

1.04 RIGHTS-OF-WAY

- A. Work performed in RIGHTS-OF-WAY (R-O-W) shall be subject to the provisions of the R-O-W agreements. In general, these easements provide for restoring the property to the condition existing before construction began, except where otherwise noted on the Drawings.

1.05 PROVISIONS FOR THE CONTROL OF DUST

- A. Sufficient precautions shall be taken during construction to minimize dust. Water shall be applied as required to control dust.

1.06 LOCATION, PROTECTION AND MAINTENANCE OF EXISTING UTILITIES, STRUCTURES AND PROPERTY

- A. Existing utilities are located and are operating in the construction area. Contractor shall contact the office of each utility operator and ascertain the extent of specific service areas. Contractor shall contact North Carolina One Call at least 48 hours prior to excavating.

- B. The location of existing utilities across or along the line of the proposed work is not necessarily shown on the Drawings and where shown is only approximately correct. The Contractor shall locate all underground lines and structures prior to excavation.
- C. The Contractor shall assume full responsibility for the protection and restoration of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, piezometers, geotechnical instruments, whether or not they are shown on the Drawings. Contractor shall carefully support and protect all such structures and utilities from injury. Damages resulting from the construction operations shall be repaired by Contractor.
- D. The Contractor shall fully cooperate at all times with the utility owners to maintain the operation of existing utilities with the least amount of interference and interruption possible. Continuous service, public health and safety considerations shall exceed all others and the Contractor's schedule, plans and work shall at all times be subject to alteration and revision if necessary for these considerations.
- E. Temporary support, adequate protection and maintenance of all underground and surface utility installations and structures, drains, sewers, and other obstructions encountered shall be provided as required by the Contractor. Arrange and pay all costs for required support of utility poles and other structures as required by the utility owners prior to excavation.
- F. No wetland areas outside the limits of construction shall be disturbed. Trees, shrubbery, fences, poles, signs and all other property shall be protected to the extent practicable.

1.07 RELOCATION OF UTILITIES AND STRUCTURES

- A. The Contractor shall be responsible for the temporary or permanent relocation of structures and utilities, including but not limited to poles, signs, fences, hydrants, valves, piping, conduits and drains that interfere with the positioning of the Work as shown on the Drawings.
- B. No relocations of utilities shall be made without approval of the Owner of the utility.
- C. All valve boxes and manhole frames and covers in intersections and elsewhere shall be adjusted as required to be flush with the final pavement surface.

1.08 CLAIMS FOR PROPERTY DAMAGE

- A. Upon notification by the Owner, the Contractor shall investigate each claim for property damage and shall file, within ten (10) days of such notification, a statement with Owner setting forth all facts and details relative to such claim.

1.09 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property (including wetlands) and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer.
- B. The Subtitle D and C&D landfills are open and waste is being deposited by the Owner. The Contractor shall be responsible for the clean-up of all wind blown debris (within the construction limits) from these operations that impact his/her ability to properly complete the work.
- C. All driveways, sidewalks, curbs and gutters disturbed by the Contractor's operations shall be restored to their original condition in accordance with NCDOT and County requirements.
- D. All fences, signs, mailboxes, and other physical features shall be protected and restored in a workmanlike manner by the Contractor. Fences and other features removed by the Contractor shall be replaced as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be regraded and restored to their original condition.

1.10 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the Contractor at his own expense.
- B. All structures shall be protected in a manner approved by the Engineer. Should any of the surfaces or other parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor at his own expense and to the satisfaction of the Engineer. If, in the final inspection of the work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by the proper materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the Contract.
- C. The Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted by the Owner.
- D. The Contractor shall maintain the Work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end that the road or structures are kept in a satisfactory condition at all times.

In the case of a contract for the placing of a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

- E. All costs of maintenance work during construction and before the project is accepted shall be included in the lump sum and/or unit prices bid on various pay items and the Contractor will not be paid an additional amount for such work.

1.11 FAILURE TO MAINTAIN ROADWAY AND DRAINAGE

- A. If the Contractor, at any time, fails to comply with the provisions of Paragraph 1.03, the Owner/Engineer will immediately notify the Contractor of such non-compliance. If the Contractor fails to remedy the unsatisfactory maintenance within 24 hours after receipt of such notice, the Owner will immediately proceed to maintain the project, and the entire cost of his maintenance will be deducted from the monies due or to become due the Contractor on the Contract.

1.12 HURRICANE PREPAREDNESS PLAN

- A. Within fifteen (15) days of the date of Notice to Proceed, the Contractor shall submit to the Engineer and Owner a Hurricane Preparedness Plan. The plan should outline the necessary measures which the Contractor proposes to perform at no additional cost to the Owner in the event of a hurricane warning. Such measures shall be in accordance with state and local requirements.
- B. In the event of inclement weather, the Contractor will, and will cause subcontractors, to protect carefully the Work and materials against damage or injury from the weather at no additional cost to the Owner. If, in the opinion of the Engineer, any portion of the Work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or subcontractors to so protect the work, such Work and materials shall be removed and replaced at the expense of the Contractor.

1.13 DAMAGE DUE TO HIGH WATER

- A. The Contractor shall hold himself responsible for all damage done to the Work by heavy rains or flood and Contractor shall take all reasonable precautions to provide against damages in a permissible manner.

1.14 EMERGENCIES

- A. The Contractor shall at all times after regular working hours, weekends and holidays, maintain a telephone where the Contractor or his representative can be reached on an emergency basis. The Contractor or his representative shall be prepared to act to correct conditions on the site deemed to constitute an emergency by either the Owner, his agent, the Engineer, or local authorities and is obligated to act to prevent threatened damage, injury, or loss without special instructions from the Owner, his agent, or the Engineer. The

Contractor shall give the Engineer prompt written notice of all significant changes in the Work or deviations from the Contract caused thereby. If a condition on the site requires attention after working hours, either the Owner, his agent, Engineer, or local authority shall call the Contractor or his representative at the emergency telephone number, identify himself and describe the emergency condition. The Contractor is expected to dispatch men and equipment to adequately institute corrective measures within two (2) hours. If the Contractor or his representative cannot be reached at the emergency number after a reasonable time (½ hour), the Owner shall have the right to immediately initiate corrective measures, and the cost of such measures shall be borne by the Contractor.

- B. Emergency phone numbers (fire, medical, police) shall be posted at the Contractor's phone and its location known to all.
- C. Accidents or incidents shall be reported immediately to the Engineer by messenger or phone.
- D. All accidents or incidents shall be documented and a fully detailed written report, including police reports if produced, submitted to the Engineer after each occurrence.

1.15 PIEZOMETER AND MONITORING WELLS PROTECTION

- A. Temporary fencing shall be installed around each existing (not scheduled for abandonment) piezometers and monitor wells, or any other monitoring device within the limits of construction prior to any construction activity in that area. If there are no bollards installed around the monitoring devices, the Contractor shall install bollards in addition to the temporary fencing.

1.16 GUARANTEE

- A. Work on this project shall be guaranteed in accordance with requirements of Article 15 of the General Conditions. Work found to be defective within 1 year (unless otherwise specified) after the date of Substantial Completion shall be corrected or replaced in accordance with the General Conditions.

1.17 DAILY REPORTS

- A. The Contractor shall submit daily reports of construction activities for all days including non-work days beginning with the start of construction and terminating with the end of demobilization. The report shall include:
 - 1. Manpower, number of men by craft (trade);
 - 2. Equipment on the project;
 - 3. Major material deliveries;
 - 4. Activities work with references to the CPM schedule activity numbers;
 - 5. Construction difficulties or concerns; and
 - 6. Any additional pertinent information.

- B. A similar report shall be submitted for or by each subcontractor.
- C. Daily reports shall be submitted to the Engineer's Field Office within two working days of the respective daily report date. Each report shall be signed by the Contractor's Superintendent or Project Manager. Subcontractor daily reports not prepared by the Contractor shall be signed by the subcontractor's responsible party on site or by the subcontractor's Project Manager.
- D. Information provided on the daily report shall not constitute notice of delay or any other notice required by the Contract documents, nor shall it constitute any requests or submittals required by the Contract documents to be in writing. Notices and requests shall be submitted as required therein.

PART 2: PRODUCTS (Not Used)

PART 3: EXECUTION (Not Used)

END OF SECTION 01041

SECTION 01050
FIELD ENGINEERING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall provide certified survey work required in execution of the Project. The term "certified" as used throughout this Section shall mean work by a surveyor registered to practice in North Carolina.
- B. Provide civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.
- C. Provide Record Drawings to be used for recovering quantities and documenting construction. All Record Drawings shall be AutoCAD 2020 format as specified in the following Sections.
- D. The Contractor shall retain the services of a professional land surveyor licensed in the State of North Carolina to perform all surveying.
- E. As a condition for reaching Substantial Completion, submit certified drawings with complete AutoCAD files signed and sealed by a North Carolina Professional Land Surveyor.

1.02 RELATED WORK

- A. Section 01010: Summary of Work
- B. Section 01025: Measurement and Payment
- C. Section 01027: Applications for Payment
- D. Section 01700: Contract Closeout
- E. Section 01720: Project Record Documents

1.03 SUBMITTALS

- A. Submit name, address, and copy of license of professional land surveyor to be used on this project to the Engineer within 10 days of the Notice to Proceed.
- B. Submit certificate with each submittal signed by a North Carolina Professional Land Surveyor certifying that elevations and locations of new work and improvements are in conformance or non-conformance with the Contract Documents.

- C. The Contractor is required to submit surveys prepared, signed and sealed by a registered land surveyor. All surveys shall be tied to North Carolina State Plane Coordinate System, NAD 1927 (Horizontal) and NAVD-29 (Vertical). These drawings shall constitute the project record documents. The Contractor shall submit each survey, along with 5 prints, and electronically in AutoCAD 2020 format. All information in the AutoCAD file must be at appropriate 3D elevation and coordinate. All entities shall be placed on layer names which adequately describe the entity being mapped.

Accuracy: Within 0.1 foot vertical and 0.5 feet horizontal in accordance with national surveying standards.

The Contractor's surveyor is required to perform, and submit to the Engineer the following types of surveys:

1. Certified aerial and field topographic map surveys and Digital Terrain Models (DTM) shall be performed at the following stages of construction:
 - a. Existing condition survey prior to initiating construction, include borrow stockpile areas.
 - b. Immediately following clearing and grubbing or stripping, and prior to starting excavation and backfilling. This topographic mapping shall be developed from either aerial photos or Global Positioning System (GPS).
 - c. Immediately following completion of excavation, backfilling and prior to starting placement of clay or synthetic liner, or any road building material. These intermediate surveys for the purpose of verifying pay quantities can be developed from GPS surveys.
 - c. The entire Buncombe County Solid Waste Management Facility at the time the Contractor intends to submit documentation to support a claim for substantial completion. This topographic mapping shall be developed from either aerial photos or GPS.

The surveys shall meet the following criteria:

- 1) 1" = 100' scale reproducible plot.
- 2) Produced at national map accuracy standards for 1" = 100' scale maps with 2' contour interval.
- 3) The DTM must contain adequate 3D points and 3D breaklines required to accurately model the photographed or surveyed surface to within above stated accuracy. The DTM must also provide a 2D polyline defining the limits of the area surveyed. The points, breaklines, and survey limits line shall be on separate

layers. The AutoCAD file of the DTM model must be compatible for use with Land Development Desktop software.

2. Cell 7 - Certified Composite Liner and Protective Cover System Survey

Provide a Certified Composite Liner System Survey with the horizontal limits of compacted soil liner material, GCL, HDPE geomembrane, fabric cushion, and protective cover.

Additionally, certified grid surveys shall be provided that show the elevations of each of the following components of the liner system: the subgrade elevations of the compacted soil liner, finish grade of compacted soil liner, and finish grade of protective cover taken on a grid pattern of 50-foot centers throughout all the constructed Cell 7 area using identical horizontal points for all three grades shall be required. Each survey shall contain the elevation data for the previous subsurface(s). The elevation data provided for each 50-foot grid point shall be presented to the hundredth of a foot.

No compacted soil liner shall be placed until a certified survey is submitted and approved by the Engineer that the subgrade elevations conform to the grades shown on the Project Drawings. No synthetic liner shall be placed until a certified survey is submitted and approved by the Engineer demonstrating that the surface of compacted soil liner material conforms to the Project Drawings and that the thickness of the compacted soil liner is a minimum of 18-inches.

Thickness certification measurements shall be made perpendicular to the survey surfaces. Vertical depths that do not account for slopes are not acceptable.

3. Phase 7 – Certified Soil Liner

Provide a Certified Soil Liner Survey with the horizontal limits of soil liner material (fill material and in-situ to the limits of the expansion). Shots for this survey shall be taken on a maximum 50-foot grid system.

4. A Certified “As-Built” Survey of the surface and subsurface structures (including topography) installed by Contractor shall be provided after completion of the project and shall include the following:

- a. Surface Facilities – including, but not limited to, limits of new road, sump pump risers, tanks, piping, pumps, channels, flumes, ponds, turnaround areas, anchor trenches, riprap aprons and outlets, seeding and mulching, and location of guardrail, concrete pads and walkway, utility poles, control panels, segregation berms, cleanouts, liner limits posts, and access ramps.
- b. Subsurface Facilities – including, but not limited to, leachate pipe, French drains, concrete pipe, PVC and metal pipe, location of drop inlets (including grate elevation), buried valves, valve boxes, meter vaults, manholes, hydrants, and electrical conduit.

5. As required, provide a certified topographic map survey(s) and DTM of the limits of undercut and unsuitable material and rippable and non-rippable rock. The initial survey shall define the aerial limits and unsuitable material surface elevations. The final survey shall define the limits and elevations of the completed unsuitable material excavation and backfill area and shall meet the following criteria:
 - a. 1" = 100' scale reproducible plot.
 - b. Produced at national map accuracy standards for 1" = 100' scale maps with 2' contour interval.
 - c. DTM must contain adequate 3D points and 3D breaklines required to accurately model the surveyed surface to within above stated accuracy. The DTM must also provide a 2D polyline defining the limits of the area surveyed. An AutoCAD file of the DTM models must be provided.
6. Provide topographic surveys and volume estimates for submittal with pay applications.

1.04 QUALIFICATIONS OF SURVEYOR

- A. Professional land surveyor of the discipline required for the specific service on the Project, currently licensed in the State of North Carolina.

1.05 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are those designated on Drawings.
- B. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.
 1. Make no changes or relocations without prior written notice to the Engineer.
 2. Report to the Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 3. Require surveyor to correctly replace project control points which may be lost or destroyed.
 - a. Establish replacements based on original horizontal and vertical survey control.

1.06 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent bench marks on site, referenced to data established by survey control points.

1. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 1. Site improvements
 - a. Stakes for grading, fill and topsoil placement.
 - b. Utility slopes and invert elevations.
- C. From time to time, verify layouts by same methods.
- D. Establish all lines and grades prior to construction of line work for all pipelines at 50-ft increments and at defined breaks in grade.

1.07 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.
- B. Update the Project Record Drawings on a monthly basis based on the work performed during the month ending at the pay request as a condition for approval of monthly progress payment requests.
- C. Maintain an accurate record of all changes, revisions, and modifications.
- D. All field survey notes will be retained by the Surveyor. The results from the field surveys will be documented on a set of Survey Record (As-Built) Drawings signed and sealed by a registered professional Engineer or professional land surveyor licensed in the State of North Carolina. The Contractor shall certify to the Owner that the results of the survey demonstrates compliance with the Contract Documents. These drawings shall, at a minimum, show the final elevations and locations of all surfaces and appurtenances surveyed.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01050

SECTION 01101

SAFETY, HEALTH AND EMERGENCY RESPONSE REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section describes the responsibilities of the Contractor for safety, health, and emergency response. Owner requires that work performed under this specification will not result in:
 - 1. Injuries to employees or other persons.
 - 2. Employee exposures to health hazards above the occupational limits established by the Occupational Health and Safety Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH), or the Nuclear Regulatory Commission (NRC).
 - 3. Exposure of area residents to air contaminants above the levels established for general public exposure by Environmental Protection Agency (EPA), NRC, or the State in which work occurs.
 - 4. Significant increases in the levels of contaminants in soil, water, or sediment near the site.
 - 5. Violations of OSHA, EPA, NRC, or State regulations.
- B. Any disregard for the provision of these Health and Safety requirements may be deemed just and sufficient cause for termination of the Contract without compensation for such termination.
- C. Maintain a comprehensive health and safety program that addresses lines of authority and responsibility for health and safety, medical monitoring, training and equipment programs, and health and safety record keeping. Site-specific requirements are discussed elsewhere in this Section.

1.02 BACKGROUND

- A. A description of the site and the hazards present within its bounds appears in Section 01041 - Project Coordination.

1.03 SUBMITTALS

- A. Submit the following documentation to the Engineer at the Pre-Construction conference:
 - 1. Name of Contractor's Health and Safety Officer
 - 2. A statement reflecting the number of employees proposed for this project who have completed the training and medical requirements required for hazardous waste projects.

- B. Submit to the Owner and Engineer, in accordance with Section 01300, within 7 calendar days after the Pre-Construction conference or within 7 calendar days after initiating mobilization activity, whichever is sooner, the following information:
 - 1. A Health and Safety Plan, which addresses the issues described in Paragraphs 1.09 B and C below.
 - 2. Certification of Health and Safety Officer's authority.
 - 3. Name and address of Contractor's consulting physician.
 - 4. Name and resume of Health and Safety Professional.
 - 5. Personal protection (including respiratory) programs, as applicable.

1.04 REGULATORY REQUIREMENTS

- A. Contractor's health and safety practices shall follow the standards and guidelines established in the publications listed below. These standards are incorporated in this Section by reference:
 - 1. Safety and Health Standards 29 CFR 1910 (General Industry), US Department of Labor, OSHA. (Hereafter, referred as "29 CFR 1910").
 - 2. OSHA Safety and Health Standards 29 CFR 1926 (Construction Industry), US Department of Labor, OSHA.
 - 3. OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response, U.S. Dept. of Labor, OSHA, and the corresponding construction standard 29 CFR 1926.62.
 - 4. Standard Operating Safety Guides, EPA, Office of Emergency and Remedial Response PB92-983414.
 - 5. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health (NIOSH).
- B. This Section implements and amplifies procedures and requirements of the above referenced regulations and guidelines. These publications define terms and establishes procedures discussed in this Section, which incorporates them by reference. Where conflicts arise between the requirements of this Section and the above-listed standards and guidelines, the most restrictive requirement shall apply.

1.05 CONTRACTOR'S PERSONNEL

- A. Assign persons to fill each of the following roles. An individual can fill as many roles as he or she is qualified.

- B. Health and Safety Officer - Designate an employee or company principal as its health and safety officer (HSO). This HSO must have the authority to command sufficient resources to safely perform the Work. Contractor shall identify its HSO in the site safety and health plan. Owner will direct health and safety correspondence to this HSO.
- C. Health and Safety Professional - Contractor shall designate a health and safety professional to take responsibility for evaluating hazards of the site and controls that will appear in the site safety plan. This professional shall be certified as either a certified industrial hygienist (CIH) or a certified safety professional.
- D. Site Health and Safety Coordinator
 - 1. Designate a Site Health and Safety Coordinator (SHSC) for this project. Day-to-day industrial hygiene support, including air monitoring, training, site safety inspections, shall be provided by the SHSC. SHSC shall have the authority to stop on-site operations when conditions threaten the health or safety of employees. The SHSC shall remain on-site during all project operations.
 - 2. SHSC shall report directly to the HSO or the CIH. SHSC shall have a sound working knowledge of occupational safety and health regulations, experience in the type of project described in these specifications, and training in air monitoring practices and techniques.
 - 3. The SHSC shall have completed all of the training required by OSHA standard 29 CFR 1910.120 paragraph (e), for supervisory personnel.
- E. On-site Operations Manager - The on-site activity of this project shall be under the control of an on-site operations manager. This manager shall have demonstratable experience with hazardous materials projects.
- F. On-site Workers - All on-site personnel who may be exposed to potential hazardous substances, health hazards, or safety hazards shall have:
 - 1. Completed a 40-hour hazardous waste health and safety training course. Either the forty-hour course or a hazardous waste health and safety refresher training course shall have occurred within the last year. This training shall be certified by its instructor to meet the requirements of OSHA standard 29 CFR 1910.120 paragraph (e).
 - 2. Completed a medical monitoring exam within the last year.
 - 3. Passed a fit test for any respirator they may wear on the site.

1.06 TRAINING

- A. Maintain, at the work site, documentation that shows each on-site employee or subcontractor that could be exposed to hazardous substances, health hazards, or safety hazards has completed the training described in Paragraph 1.05 F above. Employees shall not participate in field activities until they have been trained to a level required by their job function and responsibility.

- B. At least one person who has been trained and certified in First Aid and CPR by the American Red Cross, or an equivalent organization, shall be present on-site during all project operations.
- C. Provide a site-specific training session for Contractor personnel scheduled to work on-site. This training shall include a health and safety briefing on the following information:
 - 1. Names of personnel and alternates responsible for site safety and health.
 - 2. Injury, illness, and other hazards present on the site.
 - 3. Safe use of engineering controls and equipment on site.
 - 4. Work practices by which the employee can minimize risks from hazards.
 - 5. Selection, use, care, and maintenance of Personal Protective Equipment (PPE).
 - 6. Site control procedures, including log-in and log-out.
 - 7. Project decontamination procedures.
 - 8. Standard operating safety procedures.
 - 9. Emergency response contingency plan.
- D. Develop a training sequence to inform visitors of the hazards associated with the site; to explain emergency procedures; train them in the use of protective gear required during the visit; and to verify they have received, prior to the site visit, the required preliminary training, and medical surveillance examinations.

1.07 ACCIDENT OR INCIDENT REPORTS

- A. If an accident, an explosion or fire, or a release of toxic materials occurs during the course of the project, notify the Owner by telephone as soon as possible after emergency response agencies have been notified. Send Owner and Engineer written notification within 24 hours. Within 2 working days of any reportable accident, complete and submit to Owner, an accident report addressing the following items:
 - 1. Name, organization, telephone number, and location of the Contractor
 - 2. Name and title of the person(s) reporting.
 - 3. Date and time of the accident/incident.
 - 4. Location of the accident/incident, i.e., site location, facility name.
 - 5. Brief summary of the accident/incident giving pertinent details including type of operation ongoing at the time of the accident/incident
 - 6. Cause of the accident/incident, if known

7. Casualties (fatalities, disabling injuries).
8. Details of any existing chemical hazard or contamination.
9. Estimated property damage, if applicable.
10. Nature of damage, effect on contract schedule.
11. Action taken by Contractor to ensure safety and security.
12. Other damage or injuries sustained, public or private.

1.08 HEALTH AND SAFETY PLAN

- A. Prepare a Health and Safety Plan (H&SP) that addresses (at minimum) each concern mentioned in this Section. The H&SP shall be site-specific and shall include measures Contractor and subcontractor(s) will take to control physical, radiological, and chemical hazards associated with the project. Contractor's standard policies may constitute much of this H&SP. Contractor's HSO shall sign and date the H&SP.
- B. The H&SP shall, at a minimum address the following elements: staff organization, responsibilities, and authorities; site description; hazard analysis for each project task and operation; general and site-specific training; personal protective equipment; medical surveillance; personal and environmental exposure monitoring; standard operating safety procedures, engineering controls, and work practices; communications; illumination; site control measures; personnel hygiene and decontamination; equipment decontamination; emergency equipment and first aid; emergency response and contingency procedures; and logs, reports and record keeping.
- C. The H&SP shall address accident prevention and methods for avoiding the physical hazards, such as manholes. The accident prevention section shall address, at a minimum, the following items:
 1. Safety Meetings
 2. Fire Prevention and Protection
 3. Walking and Working Surfaces
 4. Site Housekeeping
 5. Mechanical Equipment Inspection
 6. Sanitation
 7. Daily Safety Inspections
 8. Accident Reporting

- D. Submit the H&SP to Owner and Engineer at or prior to the Pre-Construction Conference. Owner, not Engineer, will review and return it to Contractor with comments. Incorporate Owner's comments and re-submit the H&SP. This review cycle will continue until the Owner gives notice to proceed with the project. At that time, indicate commitment to following the H&SP by an affidavit, signed by the Health and Safety Officer.
- E. Notify Owner, in writing, of any modification of any provision of the H&SP. Do not implement the modification until Owner comments on the change.
- F. Quickly notify Owner, both verbally and in writing, of any unforeseen hazard, safety related factor, or condition they observe during the work at this site. In the interim, take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment in accordance with the Health and Safety Plan.

1.09 SITE - SPECIFIC EQUIPMENT PRACTICES

- A. Personnel shall wear protective equipment specified in the H&SP for each on-site task. All equipment shall carry applicable MSHA/NIOSH approvals. Contractor's H&SP shall state specific equipment requirements. Contractor may require employees to pay for their safety gear only when that gear can be used off the job.
- B. Assign personnel to an area or a task for which a respirator might be required only if they have passed a fit test with the make and model of respirator in use. Respirators shall not be interchanged between workers without cleaning and sanitizing. Canisters and filters shall be changed daily.
- C. Prescription eyeglasses worn on site must meet ANSI Z87.1. Provide prescription lens inserts for employees who need to wear full face respirators.
- D. Require personnel to wear the protective equipment specified in the safety programs and plans.
- E. All personal protective equipment worn on-site shall be decontaminated or properly disposed of at the end of each work day.
- F. Operations under this Contract will require work exposure to potentially hazardous materials. The Contractor shall, therefore, provide and assure the wearing of all necessary personal protective equipment (PPE) for its on-site personnel. All personnel entering the work area shall don, at a minimum, Level D PPE.
- G. The initial minimum level of protection for each major site activity shall be described in the H&SP. Conform to the initial level of protection unless an upgrade or downgrade is warranted by air monitoring data and an evaluation of work practices/controls.
- H. Downgrade his level of protection only when 1) the Site Health and Safety Coordinator (SHSC) makes the change based on site activity, air monitoring of contaminant levels, and work place practices as specified in the H&SP or 2) the Certified Industrial Hygienist (CIH) approves the change with the knowledge of the Engineer.

- I. The H&SP shall include a written respirator policy which meets 29 CFR 1910.134 and establishes procedures to assure daily cleaning and maintenance of respirators. Breathing air shall be Compressed Gas Association Grade D or better. Cartridges and filters shall be changed at least daily. Respirators and filter cartridges shall be stored in a place and manner that they cannot become contaminated with hazardous materials.
- J. Employees shall perform negative pressure fit-checks in accordance with manufacturers' recommendations on air purifying respirators each time they are put on. No facial hair which interferes with a satisfactory fit of a respiratory mask-to-face-seal is allowed on personnel required to wear respiratory protective equipment. A "two-day" growth of beard is considered to interfere with the fit of the respirator.

1.10 STANDARD SAFETY OPERATING PROCEDURES

- A. Maintain a set of Standard Safety Operating Procedures to be implemented for this project. Personnel shall observe the following contamination control rules while on-site.
 - 1. Eating, drinking, smoking, chewing gum or tobacco, and other practices that increase the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated contaminated.
 - 2. Hands and face shall be thoroughly washed upon leaving the work area and before eating, drinking, urinating, or other activities.
 - 3. Whenever decontamination procedures for protective clothing is in effect, the entire body shall be thoroughly washed as soon as possible after the protective clothing is removed.
 - 4. Medicine and alcohol can increase the effects of exposure to toxic chemicals. Therefore:
 - a. Personnel using prescription drugs shall inform the doctor who prescribed them of their potential contact with toxic materials;
 - b. Personnel who take over-the-counter drugs within a day before work on a site must inform the SHSC of the warnings listed on the drug's container (the part of the label that says, for example, "Do not take this medication if you are operating a motor vehicle");
 - c. Alcoholic beverage intake will be prohibited during project operations. Personnel under the influence of alcohol or recreational or illegal drugs will not be allowed on site.

1.11 GENERAL HEALTH AND SAFETY CONCERNS

- A. Each work day, Contractor's SHSC shall inspect the site and the work practices followed on the site to determine whether the H&SP is being followed.
- B. When the work area temperatures exceeds 80 degrees F (75 degrees F when workers wear synthetic coveralls), Contractor shall take steps to control heat stress among site personnel. When temperatures are lower than 32 degrees F, Contractor shall take steps to control cold

stress among site personnel. Such steps should include; dry layered clothing, break shelters, and provision of heaters.

- C. Electrical installations and appliances used by Contractor shall meet applicable 1993 National Electrical Code Standards. All electrical devices utilized by the Contractor or his subcontractors on this project shall be grounded or equipped with and utilize ground fault circuit interrupter (GFCI) protected outlets or extension cord sets. Electrical devices used in confined spaces that may contain flammable vapors shall be explosion proof.

1.12 ENVIRONMENTAL REGULATIONS

- A. Establish a system to control access to hazardous work areas by persons who do not need to enter.
- B. Conduct operations and maintain site work areas so as to minimize the creation and dispersion of contaminants, dust, and sediment.
- C. Wastes, including wash water and storm water, shall be disposed as required by State and Federal regulations.

1.13 EXPOSURE MONITORING

- A. Exposure monitoring shall be addressed in the H&SP. The exposure monitoring plan shall be designed to:
 - 1. Detect and quantify the contaminants and physical agents that may be a concern during activities
 - 2. Provide enough information to allow the site health and safety coordinator to recognize conditions that require changes in work practices or level of protection.
 - 3. Provide enough information to allow the site health and safety coordinator to recognize conditions that expose off-site populations to contaminants (including soil dust) or physical agents released during work activities.
- B. Provide all required exposure monitoring equipment and analysis. This equipment shall be operated only by personnel who have been trained in its use. Maintain and calibrate the equipment according to the manufacturer's instructions.
- C. Record exposure measurements and make them available to the Owner and Engineer upon request.

1.14 EMERGENCY PREPAREDNESS

- A. In the event of a fire or sudden release of contaminants, personnel shall quickly evacuate the area. Contractor's H&SP must document procedures Contractor will follow in the case of an injury or gross contaminant exposure.
- B. The plan for on-site and off-site emergencies shall address, at a minimum:

1. Pre-Emergency planning
 2. Personnel roles, lines of authority, training, and communication
 3. Emergency contact names and telephone numbers:
 - Medical treatment facility and physician
 - Ambulance service's telephone number
 - Fire department's telephone number
 - Police department's telephone number
 - USEPA and state spill control phone numbers
 - Engineer telephone number
 - Owner telephone number
 4. Emergency recognition and prevention
 5. Emergency alerting and response procedures
 6. Evacuation routes and procedures
 7. Safe distances and places of refuge
 8. Specific procedures for handling personnel with excessive exposure to contaminated soils or materials
 9. Personal protective equipment and emergency equipment
 10. Emergency personnel and equipment decontamination
 11. Emergency medical treatment and first aid
 12. Directions to a nearby medical treatment facility
 13. Site security and control for incidents
 14. Procedures for dealing with fires, explosions, spills
 15. Critique of response and follow-up
- C. In the event of any emergency associated with this project, Contractor shall without delay alert the Engineer as soon as possible after notifying the emergency response agencies; and institute whatever measures which might be necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency.

- D. In the event of an injury or illness among the site personnel, the certified first aid practitioner on-site will take control. The injured or ill person will be transferred to the medical facility designated in the H&SP.
- E. When an evacuation is necessary, all field team members will go to the reassembly point for that portion of the site. The H&SP shall identify the reassembly points for Contractor personnel in an evacuation.
- F. The H&SP shall identify the method by which personnel will communicate in the event of an emergency. Communications with the office trailer, if it is outside vocal range, normally occur by radio. Communications between Contractor and other organizations normally occur over the telephone. A list of emergency telephone numbers must appear in the H&SP.
- G. Provide appropriate emergency equipment, including an industrial-type first aid kit that is approved by its consulting physician for injuries and illnesses which may occur on site. A 20-pound ABC-rated fire extinguisher shall be maintained on-site. Emergency retrieval equipment shall be provided for each confined space entry.
- H. All site support vehicles shall be equipped with route maps providing directions to the medical treatment facility. All drivers of the support vehicles shall become familiar with the emergency route and the travel time required at the beginning of project operations.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01101

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Engineer shall schedule and administer a pre-construction meeting, periodic progress meetings, and specially called meetings throughout progress of the work. The Engineer shall:
 - 1. Prepare agenda for meetings.
 - 2. Make physical arrangements for meetings.
 - 3. Preside at meetings.
 - 4. Keep a record of the meeting, to include significant proceedings and decisions.
 - 5. Reproduce and distribute copies of the record within ten working days after each meeting.
 - a. To participants in the meeting.
 - b. To parties affected by decisions made at the meeting.
- B. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Contractor shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.02 RELATED REQUIREMENTS

- A. Section 00700: General Conditions
- B. Section 01310: Progress Schedules
- C. Section 01300: Shop Drawings, Product Data, and Samples
- D. Section 01625: Start-up
- E. Section 01720: Project Record Documents
- F. Section 01730: Operation and Maintenance Data

1.03 PRE-CONSTRUCTION MEETING

- A. The Engineer will schedule a pre-construction meeting prior to or on the date of the Notice to Proceed.
- B. Location: A central site, convenient for all parties, designated by the Owner.
- C. Attendance:
 - 1. Owner's Representative
 - 2. Engineer
 - 3. Engineer's Representative
 - 4. Contractor's Superintendent
 - 5. Major subcontractors
 - 6. Major suppliers
 - 7. Utilities
 - 8. Others as appropriate
- D. Agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers
 - b. Projected Construction Schedules
 - 2. Critical work sequencing
 - 3. Major equipment deliveries and priorities
 - 4. Project Coordination
 - a. Designation of responsible personnel
 - 5. Procedures and processing of:
 - a. Field decisions
 - b. Proposal requests
 - c. Submittals
 - d. Change Orders
 - e. Applications for Payment (monthly date of Payment to be determined)
 - 6. Adequacy of distribution of Contract Documents
 - 7. Procedures for maintaining Record Documents

8. Use of premises:
 - a. Office, work and storage areas
 - b. Owner's requirements
9. Construction facilities, controls and construction aids
10. Temporary utilities
11. Housekeeping procedures

1.04 PROGRESS MEETINGS

- A. The Engineer will schedule regular progress meetings. The progress meetings will be held approximately every 14 to 30 days with the first meeting 14 days after the pre-construction meeting or no later than 30 days after the date of Notice to Proceed.
- B. Engineer, Owner, or Contractor may hold or call meetings as required by progress of the work.
- C. Location of the meetings: Project field office of Engineer.
- D. Attendance:
 1. Owner's Representative
 2. Engineer, and his professional consultants as needed.
 3. Engineer's Representative
 4. Contractor's Superintendent
 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. Measures and procedures to maintain 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.
 11. Maintenance of quality standards.
 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, in order 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 01300.
- H. The Contractor is to provide a current Construction Schedule at each progress meeting in accordance with Section 01310.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01200

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings, Product Data, and Samples. Detailed submittal requirements are specified in the technical specification sections.
- B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing No. or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.

1.02 SCHEDULE OF SUBMITTALS

- A. Per the requirements of Section 00700, Paragraph 2.05, prepare a complete schedule of submittals.
 - 1. Coordinate Schedule of Submittals with the list of subcontractors, schedule of values, product listing, as well as the Contract construction schedule.
 - 2. Prepare the schedule in chronological order. Provide the following information for each submittal:
 - a. Submittal category and name.
 - b. Name of Contractor, if applicable.
 - c. Brief description of the part of the Work covered.
 - d. Related Section number.
 - e. Scheduled date for deliver of submittal to Engineer
 - f. Scheduled date for the Engineer's final review of submittal.
 - 3. Prepare the Schedule of Submittals with columns for recording actual dates of submittal processing.
- B. Distribution: Following response to initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, suppliers and other parties who are required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

- C. Updating Schedule of Submittals: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.03 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings, as defined in the General Conditions, and as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
Standard Product information prepared without specific reference to Project requirements will not be considered a shop drawing.
2. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
3. The Contractor shall check all subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
4. All details on shop drawings submitted for approval shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.
5. Facsimiles or copies of facsimiles will not be accepted for review.

B. Product Data

1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the Manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the Work.
2. Facsimiles or copies of facsimiles will not be accepted for review.

C. Working Drawings

1. When used in the Contract Documents, the term "working drawings" shall be considered to mean the Contractor's plans for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework; and for such other work as may be required for construction but does not become an integral part of the Project.
2. Working drawings shall be prepared and sealed by a registered Professional Engineer, currently licensed to practice in the State of North Carolina. The Contractor shall submit a letter of certification from the Professional Engineer stating that he/she has prepared the designs and has verified that the materials/ equipment have been installed as designed. No working drawings or calculations/computations relating to the working drawings shall be submitted to the Engineer unless specifically requested in writing.

D. Samples

1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the Work.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
 1. Field measurements
 2. Field construction criteria
 3. Catalog numbers and similar data
 4. Conformance with the Specifications
- B. Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package.
- C. The Contractor shall utilize a 10-character submittal identification numbering system in the following manner:

1. The first character shall be a D, S, P, M, or R, which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P), Operating/Maintenance Manual (M), or Request for Information (R).
2. The next five digits shall be the applicable Specification Section Number.
3. The next three digits shall be the numbers 001-999 to sequentially number each initial separate item or drawing submitted under each specific Section number.
4. The last character shall be a letter, A-Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc.

A typical submittal number would be as follows:

D-03300-008-B

D	=	Shop Drawing
03300	=	Specification Section for Concrete
008	=	The eighth initial submittal under this specification section
B	=	The second submission (first resubmission) of that particular shop drawing

- D. Notify the Engineer in separate written correspondence, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents. **Deviations from the requirements of the Contract Documents included in a submittal reviewed by the Engineer or his consultants are not accepted unless they have been identified by the Contractor in writing and specifically acknowledged as having been reviewed by the Engineer.**
- E. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his/her responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.
- F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.05 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and Schedule of Submittals and in such sequence as to cause no delay in the Work or in the work of any other Contractor.
- B. The Contractor shall submit to the Engineer all shop drawings and data sufficiently in advance of construction requirements to provide no less than twenty-one (21) calendar days for review from the time the Engineer receives them. No less than thirty (30) calendar days will be required for major equipment that requires review by more than one Engineering discipline. Each re-submission of a shop drawing will establish a new 21 or 30 calendar day review period.
- C. Number of submittals required:
 - 1. Shop Drawings as defined in Paragraph 1.03 A: Nine copies.
 - 2. Product Data as defined in Paragraph 1.03 B: Nine copies.
 - 3. Samples: Submit the number stated in the respective Specification Sections.
- D. Submittals shall contain:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number.
 - 3. Contractor identification.
 - 4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 5. Identification of the product, with the specification section number, page and paragraph(s).
 - 6. Field dimensions, clearly identified as such.
 - 7. Relation to adjacent or critical features of the Work or materials.
 - 8. Applicable standards, such as ASTM or Federal Specification numbers.
 - 9. Identification of deviations from Contract Documents.
 - 10. Identification of revisions on resubmittals.
 - 11. An 8-in x 3-in blank space for Contractor and Engineer stamps.

1.06 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

- A. The review of shop drawings, data, and samples will be for general conformance with the design concept and Contract Documents. They 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.
- B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. If the shop drawings, data or samples as submitted describe variations 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 on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.
- F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered "Not Approved" until resubmitted. The Engineer may at his/her option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- G. Repetitive Review
 - 1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based upon a flat rate of \$120.00 per hour. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.

2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture.

I. 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 make no further changes therein except upon written instructions from the Engineer.

J. Request for Information (RFI) shall be submitted on a standard form provided by the Engineer. RFIs shall indicate their importance to the timely completion of the project. RFIs will be processed as a shop drawing unless there is an urgent need for immediate response.

1.07 DISTRIBUTION

A. Number of approved shop drawing copies distributed to the Contractor by the Engineer shall not exceed 4.

1.08 GENERAL PROCEDURES FOR SUBMITTALS

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

END OF SECTION 01300

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.01 GENERAL

- A. Construction under this Contract must be coordinated to assure that construction is completed within the time allowed by the Contract Documents. The Contractor shall also coordinate his activities with the other contractors to allow orderly and timely completion of all the work.
- B. When access through interface and/or overlapping construction areas must be disrupted, the Contractor shall provide alternate acceptable access for other contractors.
- C. The Contractor is required to coordinate his activities in the interface or common areas with these other Contractors and the landfill operators. The Contractor must submit to the Engineer a description and schedule as to how the common areas will be utilized, recognizing the required coordination with other contractors and the Owner.

1.02 CONSTRUCTION SCHEDULING GENERAL PROVISIONS



- A. No work shall be done between 7:00 P.M. and 7:00 A.M. nor on Sundays or the following holidays: New Year's Day, July 4th, Thanksgiving Day, and Christmas Day. Contractor may perform Work outside regular working hours on Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.
- B. Night work may be established by the Contractor as acceptable procedure with the written permission of the Owner. Such permission, however, may be revoked at any time by the Owner if the Contractor fails to maintain adequate equipment and supervision for the proper execution and control of the work at night.
- C. The Contractor shall be fully responsible for providing all temporary piping, plumbing, electrical hook-ups, heating, ventilating, air conditioning, lighting, temporary structure, or whatever is required to maintain existing landfill operations. All details of temporary piping and temporary construction are not necessarily shown on the Plans or covered in the Specifications. However, this does not relieve the Contractor of the responsibility to ensure that construction will not interrupt daily operations at the landfill.
- D. The Contractor shall have the capability of preparing and utilizing the specified critical path method (CPM) scheduling technique. A statement of CPM capability shall be submitted in writing to the Engineer within ten calendar days of Notice of Award of the Contract and will verify that either the Contractor's organization has the in-house capability qualified to use the technique or that the Contractor employs a consultant who is so qualified. Capability shall be verified by description of the construction projects to which the Contractor or his consultant has successfully applied the CPM scheduling technique which shall include at least two (2) projects valued at the bid price of this Project and at least one Project which was controlled throughout the duration of the Project by means of systematic use and updating of a computer-based CPM

schedule. The submittal shall include the name of the individual on the Contractor's staff who will be responsible for the CPM schedule and for providing the required updating information.

1.03 PROGRESS OF THE WORK

- A. The work shall be executed with such progress as may be required to prevent any delay to the general completion of the work. The work shall be executed at such times and in or on such parts of the Project, and with such force, materials and equipment to assure completion of the work in the time established by the Contract.
- B. If the Contractor for his convenience and at his own expense, should desire to carry on his work outside regular working hours, he shall submit written notice to the Engineer and he shall allow ample time for the satisfactory arrangement to be made for inspecting the work in progress. The Contractor shall reimburse the Owner for extra inspection required for work outside regular working hours (as defined in GC 7).

PART 2 PROGRESS SCHEDULE SUBMITTALS

2.01 GENERAL REQUIREMENTS

- A. The Contractor shall submit a CPM schedule as described herein.
- B. The critical path schedule requirement will consist of estimated and preliminary progress schedules, monthly progress status reports (Monthly Status Reports), an as-built schedule report, and revisions to the schedules and analyses as prescribed. The planning, scheduling, management, and execution of the work is the sole responsibility of the Contractor. The progress schedule requirement is established to allow Engineer to review Contractor's planning, scheduling, management and execution of the work; to assist Engineer in evaluating work progress and make progress payments; to allow other contractors to cooperate and coordinate their activities with those of the Contractor; and to provide Owner with information about "construction schedule" and "cumulative outlay schedule".
- C. The current Schedule, if concurred by Owner, shall have legal status as long as it is used by Contractor for planning, organizing, directing, managing, and executing the work in accordance with the Contract Documents. Legal status will further imply that Contractor will use the schedule to report progress and, further, that Contractor and Owner will use the schedule for determining delay(s) in achieving the Contract date(s) stipulated in the Contract subject to the requirements of this section of the General Requirements.
- D. Engineer will, upon receipt and review of each schedule submittal, either indicate in writing a recommendation of concurrence and present the submittal to Owner, or return the submittal to Contractor indicating in writing Engineer's reasons for refusing to recommend concurrence. In the latter case, Contractor will be required to make the necessary corrections and resubmit. If Contractor fails to provide submittals as required, he/she will be deemed not to have provided a basis upon which progress may be evaluated, which may constitute reasons for refusing to recommend progress payments.
- E. Engineer's review of the schedule submittals shall be only for conformance with the information given in the Contract Documents and shall not extend to the means, methods, sequences and

techniques or procedures of construction or to safety precautions or programs incident thereto. Engineer's review of the schedule submittals will be predicated on a Contractor's stamp of approval signed off by Contractor and those subcontractors and suppliers performing work under an appropriate agreement with Contractor. Contractor's stamp of approval on any schedule submittal shall constitute a representation to Owner and Engineer that Contractor has either determined or verified all data on the submittal, or assumes full responsibility for doing so, and that Contractor and his subcontractors and suppliers, have reviewed and coordinated the sequences shown in the submittal with the requirements of the work under the Contract Documents.

2.02 FORM OF SCHEDULES

- A. Upon concurrence, prepare schedules in the form of a horizontal bar chart diagram. The diagram shall be time scaled and sequenced by work areas. Horizontal time scale shall identify the first work day of each week.
- B. Activities shall be at least as detailed as Section 00300. Activity durations shall be in whole working days. In addition, activity man-days shall be shown for each activity or alternatively tabulated in an accompanying report.
- C. Diagrams shall be neat and legible and submitted on sheets at least 24 inches by 36 inches suitable for reproduction. Scale and spacing shall allow space for notations and future revisions.

2.03 CONTENT OF SCHEDULES

- A. Each monthly schedule shall be based on data as of the last day of the current pay period.
- B. Description of each activity shall be brief but convey the scope of work described.
- C. Activities shall identify all items of work that must be accomplished to achieve substantial completion, such as items pertaining to Contractor's installation and testing activities; items pertaining to the approval of regulatory agencies; Contractor's time required for submittals, fabrication and deliveries; the time required by Engineer to review all submittals as set forth in the Contract Documents, items of work required of Owner to support pre-operational, start-up and final testing; time required for the relocation of utilities. Activities shall also identify interface milestones with the work of other contractors performing work under separate contracts with Owner.
- D. Schedules shall show the complete sequence of construction by activities. Dates for beginning and completion of each activity shall be indicated as well as projected percentage of completion for each activity as of the first day of each month.
- E. Submittals schedule for shop drawing review, product data, and samples shall show the date of Contractor submittal and the date approved submittals will be required by the Engineer, consistent with the time frames established in the Specifications.
- F. For Contract change orders granting time extensions, the impact on the Contract date(s) shall equal the calendar-day total time extension specified for the applicable work in the Contract change order.

- G. For actual delays, add activities prior to each delayed activity on the appropriate critical path(s). Data on the added activities of this type shall portray all steps leading to the delay, and shall further include the following: separate activity identification, activity description indicating cause of delay, activity duration consistent with whichever set of dates below applies, the actual start and finish dates of the delay or, if the delay is not finished, the actual start date and estimated completion date.
- H. For potential delays, add an activity prior to each potentially delayed activity on the appropriate critical path(s). Data for added activities of this type shall include alternatives available to mitigate the delay including acceleration alternatives, and further show the following: separate activity identification, activity description indicating cause of the potential delay, and activity duration equal to zero work days.
- I. The Contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any Contract completion date, he shall furnish such justification and supporting evidence as the Engineer may deem necessary for a determination as to whether the Contractor is entitled to an extension of time under the provisions of the Contract. Engineer will, after receipt of such justification and supporting evidence make findings of act and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any extension of any Contract completion date under the provisions of this Contract, the Engineer's determination as to the total number of days extension shall be based upon the currently concurred schedule and on all data relevant to the extension. Such data shall be included in the next monthly updating of the schedule. The Contractor acknowledges and agrees that actual delays in the activities which, according to the schedule, do not affect any Contract completion data shown by the critical path in the schedule and do not have any effect on the Contract completion date or dates, and therefore, will not be the basis for a change therein.
- J. From time to time, it may be necessary for the Contract schedule and/or completion time to be adjusted by the Engineer to reflect the effects of job conditions, weather, technical difficulties, strikes, excusable delays on the part of the Owner or his representatives, and other unforeseeable conditions which may indicate schedule adjustments and/or completion time extension. Under such conditions, the Contractor shall reschedule the work and/or Contract completion time to reflect the changed conditions, and the Contractor shall revise his schedule accordingly. No additional compensation shall be made to the Contractor for such schedule changes for excusable overall Contract time extension beyond the actual completion of all unaffected work in the Contract, in which case the Contractor shall take all possible action to minimize any time extension and any additional cost to the Owner. It is specifically pointed out that the use of available float time in the schedule may be used by the Owner as defined by the Engineer, as well as by the Contractor. Float time is defined as the amount of time between the early start date, and the late start date, or the early finish date and the late finish date, of any of the activities in the schedule.
- K. The Owner controls the float time in the concurred schedule, and, therefore, without obligation to extend either the overall completion date or any intermediate completion dates set out in the schedule, the Owner may initiate changes to the Contract work that absorb float time only. Owner-initiated changes that affect the critical path on the approved schedules shall be the sole grounds for extending (or contracting) said completion dates. Contractor-initiated changes that encroach on the float time identified in the concurred schedule may be accomplished with the

Owner's concurrence. Such changes, however, shall give way to Owner-initiated changes competing for the same float time.

2.04 SUPPORTING NARRATIVE

- A. Status and Scheduling reports identified below shall contain a narrative to document the project status, to explain the basis of Contractor's determination of durations, describe the Contract conditions and restraints incorporated into the schedule, and provide an analysis pertaining to potential problems and practical steps to mitigate them.
- B. The narrative shall specifically include:
 - 1. Actual completion dates for activities completed during the quarterly report period, and actual start dates for activities commenced during the quarterly report period.
 - 2. Anticipated start dates for activities scheduled to commence during the following quarterly report period.
 - 3. Changes in the duration of any activity and minor logic changes.
 - 4. The progress along the critical path in terms of calendar days ahead or behind the Contract Date.
 - 5. If the Monthly Status Report indicates an avoidable delay to the Contract Completion date or interim completion dates as specified in the Contract, Contractor shall identify the problem, cause and the activities affected and provide an explanation of the proposed corrective action to meet the milestone dates involved or to mitigate further delays.
 - 6. If the delay is thought to be unavoidable, the Contractor shall identify the problem, cause, duration, specific activities affected and logic restraints of each activity.
 - 7. The narrative shall, in addition, also discuss all change order activities whether included or not in the revised/current schedule of legal status. Newly introduced Change Order work activities, and the CPM path(s) that they affect, must be specifically identified. All Change Order work activities added to the schedule shall conform with the sequencing and Contract Time requirements of the applicable Change Order.
 - 8. Original Contract date(s) shall not be changed except by Contract Change Order. A revision, as specified in Article 3.06 below, need not be submitted when the foregoing situations arise unless required by Engineer. Review of a report containing added activities will not be construed to be concurrence with the duration of restraints for such added activities; instead the corresponding data as ultimately incorporated into the applicable Contract Change Order shall govern.
 - 9. Should Engineer require additional data, this information shall be supplied by Contractor within ten (10) calendar days.

PART 3 EXECUTION

3.01 SUBMITTALS

- A. Contractor shall submit Estimated and Preliminary Progress Schedules (as identified in the Instructions to Bidders and the General Conditions, and Section 00100), monthly status reports, and an as-built schedule report all as specified herein.
- B. All schedules, including estimated and preliminary schedules, shall be in conformance with Articles 2.01, 2.02 and 2.03 above.
- C. The initial finalized progress schedule shall be the first monthly status report and as such shall be in conformance with all applicable specifications contained herein.
- D. Monthly Status Report submittals shall include five copies of a time-scaled (days after Notice-To-Proceed) diagram (color) showing all Contract activities, tabular activity and total float reports, and supporting narrative. The initial detailed schedule shall use the Notice-To-Proceed as the data date. The finalized schedule, if concurred with by Owner pursuant to Paragraph 2.01(C), shall be the work plan to be used by the Contractor for planning, scheduling, managing, and executing the work.
- E. The schedule diagram shall be formatted in accordance with Article 2.02 above. The diagram shall include (1) all detailed activities included in the preliminary and estimated schedule submittals, (2) calendar days prior to substantial completion, (3) summary activities for the remaining sixty (60) days.

The critical path activities shall be identified, including critical paths for interim dates, if applicable.

- F. Contractor shall submit monthly progress schedules with each month's Application for Payment. Engineer will review schedules and return review copy within ten (10) calendar days after receipt. If required, Contractor shall resubmit within seven (7) calendar days after return of review copy.
- G. Contractor shall submit the number of monthly status reports which the Contractor requires, plus five (5) copies which will be retained by the Engineer.

3.02 MONTHLY STATUS REPORTS

- A. Contractor shall submit five (5) copies of detailed schedule status reports on a monthly basis with the Application for Payment. The first such status report shall be submitted with the first Application for Payment and include data as of the last day of the pay period. The Monthly Report shall include an "up-dated" copy of the latest detailed schedule of legal status, tabular activity and total float reports, and a supporting narrative including updated information as described in Paragraph 2.04. The Monthly Report will be reviewed by Engineer and Contractor at a monthly schedule meeting, and Contractor will address Engineer's comments on the subsequent monthly report. Monthly status reports shall be the basis for evaluating Contractor's progress.
- B. The "up-dated" diagram shall show, for the latest detailed schedule of legal status, percentages of completion for all activities, actual start and finish dates, and remaining durations, as appropriate. Activities not previously included in the latest detailed schedule of legal status shall be added,

except that contractual dates will not be changed except by Change Order. Review of an “Updated” diagram by Engineer will not be construed to constitute concurrence with the time frames, duration, or sequencing for such added activities; instead the corresponding data as ultimately incorporated into an appropriate Change Order shall govern.

3.03 STARTUP SCHEDULE

- A. At least 90 calendar days prior to the date of substantial completion, Contractor shall submit a time-scaled (days after Notice to Proceed) diagram detailing the work to take place in the period between 60 days prior to substantial completion and substantial completion, together with a supporting narrative. Engineer shall have twenty (20) calendar days after receipt of the submittal to respond. Upon receipt of Engineer's comments, Contractor shall make the necessary revisions and submit the revised schedule within ten (10) calendar days. The resubmittal, if concurred with by Owner, shall be the Work Plan to be used by Contractor for planning, managing, scheduling and executing the remaining work leading to substantial completion.
- B. The time-scaled diagram shall use the latest schedule of legal status for those activities completed ahead of the last sixty (60) calendar days prior to substantial completion, and detailed activities for the remaining sixty (60) day period within the time frames outlined in the latest schedule of legal status.
- C. Contractor will be required to continue the requirement for monthly reports, as outlined in Article 3.02 above. In preparing this report, Contractor must assure that the schedule is consistent with the progress noted in the startup schedule.

3.04 AS-BUILT SCHEDULE

After substantial completion but prior to final payment, Contractor shall submit as-built schedule report and time-scaled as-built diagram. The documents shall reflect all as-built critical paths. The diagram shall be prepared in accordance with Articles 2.02 and 2.03, in addition to the following:

- A. All Contract activities, including all added activities, shall be shown.
- B. Activity durations shall be the actual number of separate work days during which work was performed on the activity.
- C. Contract milestone completions shall be plotted on the date of the Substantial Completion Reports.

3.05 REVISIONS

- A. All revised Schedule Submittals shall be made in the same form and detail as the initial submittal and shall be accompanied by an explanation of the reasons for such revisions, all of which shall be subject to review by Engineer and concurrence by Owner. The revision shall incorporate all previously made changes to reflect current as-built conditions. Minor changes to the approved submittal may be approved at monthly meetings; a minor change is not considered a revision in the context of this paragraph.

- B. A revised schedule submittal shall be submitted for review, when required by Engineer, for one of the following reasons:
 - 1. Owner or Engineer directs a change that affects the date(s) specified in the Agreement or alters the length of a critical path.
 - 2. Contractor elects to change any sequence of activities so as to affect a critical path of the current schedule documents.
- C. If, prior to agreement on an equitable adjustment to the Contract time, Engineer requires revisions to the schedule in order to evaluate planned progress, Contractor shall provide an interim revised submittal for review with change effect(s) incorporated as directed. Interim revisions to the documents which are recommended to the Owner for concurrence will be incorporated in the next Monthly Status Report.

3.06 CONSTRUCTION PERIOD

- A. The Contractor's attention is directed to the form of Contract (Section 00500) which specifies Contract times for the Work.
- B. Whenever it becomes apparent from the current monthly progress evaluation and updated schedule data that any milestone and/or Contract completion date will not be met, the Contractor shall take some or all of the following actions:
 - 1. Increase construction manpower in such quantities and crafts as shall subsequently eliminate the backlog of work;
 - 2. Increase the number of working hours per shift, shifts per work day, work days per week, or the amount of construction equipment, or any combination of the foregoing sufficient to substantially eliminate the backlog of work; and
 - 3. Reschedule work items to achieve concurrence of accomplishment.
- C. The addition of equipment or construction forces, increasing the working hours or any other method, manner, or procedure to return to the current Detailed Schedule shall be at the Contractor's own cost and shall not be considered justification for a Change Order or treated as an acceleration order.
- D. Failure on the part of the Contractor to take appropriate schedule recovery action as specified above shall constitute grounds for increasing the retention on progress payments.

END OF SECTION 01310

SECTION 01380

CONSTRUCTION PHOTOGRAPHY

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall employ a competent photographer to take construction record photographs periodically during course of the Work.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work
- B. Section 01390: Pre-Construction Photography
- C. Section 01720: Project Record Documents

1.03 PHOTOGRAPHY REQUIRED

- A. Prior to the start of construction, complete pre-construction photography in accordance with Section 01390.
- B. Complete monthly aerial color photography and specific aerials including prior to the start of construction, one during synthetic liner deployment (HDPE geomembrane, GCL and fabric cushion) and one at the completion of the project. Drone technology is acceptable. Views shall be as approved the Engineer. Provide digital files of monthly aerial color photographs.
- C. Complete construction progress photography and provide digital files of construction progress photographs with each pay application.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 TECHNIQUE

- A. Correct exposure and focus.
 - 1. High resolution and sharpness.
 - 2. Maximum depth-of-field.
 - 3. Minimum distortion.

3.02 VIEWS REQUIRED

- A. Photograph from locations to adequately illustrate condition of construction and state of progress.
 - 1. At successive periods of photography, take at least one photograph from the same overall view as previously.
 - 2. Consult with the Engineer at each period of photography for instructions concerning views required.

END OF SECTION 01380

SECTION 01390

PRE-CONSTRUCTION PHOTOGRAPHY

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment, and incidentals required to video and/or photograph all construction areas within the project area, as shown in the Drawings and as specified herein.

1.02 RELATED WORK (REQUIREMENTS)

- A. The Contract Documents include, but are not limited to, the following related requirements:
 - 1. Section 01380: Construction Photography
 - 2. Section 01720: Project Record Documents

1.03 QUALIFICATIONS

- A. The photography shall be done by a competent professional camera operator who is fully experienced and qualified with the specified equipment as well as knowledgeable about the project limits.
- B. The audio shall be done by a person qualified and knowledgeable in the specifics of the contract, who shall speak with clarity and diction so as to be easily understood.

1.04 COSTS OF PHOTOGRAPHY

- A. The Contractor shall pay costs for specified photography and prints.

1.05 PRECONSTRUCTION AUDIOVISUAL VIDEO

- A. Video recordings shall not be made more than 60 days prior to construction. No construction shall begin prior to submittal and review of the videos covering the construction area by the Engineer. The Engineer shall have the authority to reject all or any portion of a video not conforming to specifications and require that it be redone at no additional charge. The Contractor shall reschedule unacceptable coverage within five days after being notified. The Engineer shall designate those areas, if any, to be omitted from or added to the audiovisual coverage. All tapes and written records shall become the property of Owner.
- B. The color audiovisual video shall be prepared by a skilled and competent professional with knowledge of the project limits.
- C. Digital files of the audiovisual video and photography shall be submitted by the Contractor.

PART 2 PRODUCTS

2.01 AUDIOVISUAL RECORDING

- A. The audiovisual recording employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright, sharp, clear pictures with accurate colors and shall be free from distortion or any other form of picture imperfection. All video recordings shall be electronic means, display on the screen the time of day, the month, day and year of the recording. This time and date information must be continuously and simultaneously generated with the actual recording. The audio portion of the recording shall produce the commentary of the camera operator with proper clarity and be free from distortion.

PART 3 EXECUTION

3.01 TECHNIQUE

- A. Factual presentation
- B. Correct exposure and focus
 - 1. High resolution and sharpness
 - 2. Maximum depth-of-field
 - 3. Minimum distortion

3.02 VIEWS REQUIRED

- A. Photograph from locations to adequately illustrate the existing condition of the entire construction site and landfill prior to initiating construction.

3.03 PAYMENT

- A. The work specified in this Section shall be considered incidental and the cost shall be included as part of the unit prices for the project.

3.04 AUDIOVISUAL RECORDING

- A. The recordings shall contain coverage of all surface features within the construction zone of influence. These features shall include, but not be limited to, all roadways, pavement, tanks, drainage ditches, sedimentation ponds, railroad tracks, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, landscaping, trees, and fences. Of particular concern shall be the existence or non-existence of any faults, fractures or defects. Tapes coverage shall be limited to one side of the street at one time and shall include all surface conditions located within the zone of influence supported by appropriate audio description. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.

- B. Accompanying the video recording of each video tape shall be a corresponding and simultaneously recorded audio recording. This audio recording, exclusively containing the commentary of the camera operator, shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the features being shown in the video portion of the recording. The audio recording shall also be free from any conversation between the camera operator and any other production technicians.
- C. Visibility: All recording shall be performed during times of good visibility; no recording shall be done during periods of significant precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subject and to produce sharp, bright video recordings of those subjects.
- D. In order to ensure the continuity of coverage, the coverage shall consist of a single continuous unedited recording which begins at one end of a particular construction area; however, where coverage is required in areas not accessible by conventional wheeled vehicles and smooth transportation of the recording system is not possible, such coverage shall consist of an organized interrelated sequence of recordings at various positions along that proposed construction area (e.g., wooded easement area). Such coverage shall be obtained by walking or by a special conveyance approved by the Engineer.

END OF SECTION 01390

SECTION 01410

TESTING AND LABORATORY SERVICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Owner will employ and pay for the services of an independent Quality Control Laboratory (QCL) to perform soil, concrete, asphalt, and stone material testing specifically indicated in the Contract Documents and may at any time elect to have materials and equipment tested for conformity with the Contract Documents.
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations for quality control to perform the Work of the Contract.
- B. Contractor shall employ and pay for the services of an independent GRI certified QCL to perform geosynthetic material testing specifically indicated in the Contract Documents.
 - 1. Contractor shall submit to the Engineer the original signed laboratory report from the lab for the CQA testing required by the Contract Documents. Contractor shall also submit to the Engineer all copies of laboratory test results.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations for quality control to perform the Work of the Contract.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- B. Respective sections of specifications: Certification of products.
- C. Each specification section listed: Laboratory tests required and standards for testing.
- D. Testing laboratory inspection, sampling and testing is required for but not limited to the following:
 - 1. Section 02200: Excavation, Backfill, and Compaction
 - 2. Section 02271: Fabric Cushion
 - 3. Section 02272: Filter Fabric
 - 4. Section 02277: Geosynthetic Clay Liner

5. Section 02278: Compacted Soil Liner
6. Section 02505: Crushed Stone Paving
7. Section 02700: Protective Cover Material
8. Section 02776: High Density Polyethylene (HDPE) Geomembrane

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of the Work.
 3. Perform any duties of the Contractor.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to work, to manufacturer's operations.
- B. Secure and deliver (by hand or overnight delivery service) to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory designated by the Engineer the preliminary design mix proposed to be used for concrete and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.
- E. Furnish incidental labor and facilities:
 1. To provide access to work to be tested.
 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
 3. To facilitate inspections and tests.
 4. For storage and curing of test samples.

- F. Notify laboratory sufficiently in advance (48 hours, min.) of operations to allow for laboratory assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- G. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.
- H. If the test results indicate the material or equipment complies with the Contract Documents, the Owner shall pay for the cost of the testing laboratory excluding the testing costs associated with the geosynthetic material. If any test indicates the materials and equipment fail to meet the requirements of the Contract Documents, the Contractor shall incur the cost of all re-tests and all associated labor costs. The total of such costs shall be deducted from payment due the Contractor.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01410

SECTION 01510
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish, install and maintain temporary utilities required for construction and remove on completion of Work.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work
- B. Section 01590: Field Offices

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with National Electric Code.
- B. Comply with Federal, State and local codes and regulations and with utility company requirements.
- C. Comply with North Carolina Department of Transportation Regulations.

PART 2 PRODUCTS

2.01 GENERAL MATERIALS

- A. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING

- A. Arrange with utility company, provide service required for power and lighting, and pay all costs for service and for power used in construction and testing.
- B. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available as required for construction by the use of construction-type power cords.

2.03 TEMPORARY VENTILATION

- A. Provide temporary ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work to meet specified OSHA requirements.

- B. Provide temporary ventilation, if necessary, to protect materials from damage due to temperature or humidity.

2.04 TEMPORARY TELEPHONE SERVICE/INTERNET

- A. Arrange with local telephone service company, provide direct line telephone service at the construction site for the use of Contractor's personnel, subcontractors, Engineer and Owner. Service required:
 - 1. Two direct telephone lines and two internet hotspots (min. 200 Mbps) in the Engineer's Field Office.
 - 2. Other telephones at the option of the Contractor, or as required by regulations.
- B. Pay all costs for installation, maintenance and removal, service charges for local calls, long distance, connection to the Engineer's home office computer network, and internet charges for the Engineer's Field Office.

2.05 TEMPORARY WATER

- A. Provide and pay for all required water for construction and consumptive purposes in accordance with local standards and requirements.

2.06 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations.
- B. Service, clean and maintain facilities and enclosures.

2.07 TEMPORARY PUMPS

- A. Provide temporary pumps for removal of water from the excavation and fill areas when required by the Work to maintain proper conditions for construction.

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain and operate systems to assure continuous service.
- B. Modify and extend systems as work progress requires.

3.02 REMOVAL

- A. Completely remove temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.

- C. Restore permanent facilities used for temporary services to specified condition.

END OF SECTION 01510

SECTION 01590

FIELD OFFICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish, install and maintain temporary field offices for the Engineer's Representative and the Contractor during entire construction period and up to 30 days after final completion.
- B. The Contractor shall furnish, install and maintain storage and work sheds needed for construction.
- C. At completion of work, the Contractor shall remove field offices, sheds and contents.

1.02 SUBMITTALS

- A. Prior to installation of offices, consult with the Engineer and Owner on location, access and related facilities.
- B. Submit to the Engineer for approval a layout of the Engineer's Field Office and product data on the furnishings specified below.

1.03 REQUIREMENTS FOR FACILITIES

- A. Construction:
 - 1. Structurally sound, weathertight, with floors raised above ground.
 - 2. Temperature transmission resistance: Compatible with occupancy and storage requirements.
 - 3. At Contractor's option, portable or mobile buildings may be used.
 - a. Mobile trailers, when used, shall be modified for office use.
 - b. Do not use mobile trailers for living quarters.
- B. Office for the Engineer/Resident Project Representative:
 - 1. Furnish equipment and maintain one office trailer for the use of the Engineer with secure entrance doors and one key per occupant. This trailer will remain on site and equipped as specified below for a minimum of 30 days after final completion.

2. Area: The field office shall be a minimum 750 sf trailer. The trailer shall be in good condition, and acceptable to the Engineer and Owner. Trailer shall be partitioned into five rooms; CQA testing room with closet, two offices, conference room and a washroom.
3. Windows:
 - a. Minimum: 3, with a minimum total area of 10% of floor area.
 - b. Operable sash and insect screens.
 - c. Locate to provide view of construction areas.
 - d. Provide operable Venetian blinds for all windows.
4. Furnishings:
 - a. Two standard size desks, 30-inch x 60-inch with upholstered chairs, and three drawers, with locks and keys.
 - b. One drafting table: 39 inches (1 meter) x 72 inches (1.8 meters) x 36 inches (0.92 meter) high with one equipment drawer.
 - c. Two 4-drawer legal-size metal filing cabinets with lock, keys, and "Pendaflex" type hanging folder frames.
 - d. One mobile plan rack to hold a minimum of twelve racks of project drawings.
 - e. Six linear feet of bookshelves per desk (min. 4-ft high).
 - f. One drafting table stool, with back.
 - g. One wastebasket per desk and table.
 - h. One tackboard, 36 inches x 24 inches
 - i. Two fire extinguishers.
 - j. One industrial first aid kit, Mr. First Aid Kit No. 8029 or equal.
 - k. One minimum/maximum thermometer (Taylor or equal) and one rain gauge.
 - l. Printer/scanner/copier machine (Canon® PIXMA™ TS9520 Wireless Color Inkjet All-In-One Printer or equal).
 - m. One refrigerator, minimum 16 cubic feet capacity.
 - n. One 4-ft x 12-ft conference table, 12 chairs.
 - o. Answering machine.

- q. One bottled water dispenser with two taps, one hot and one cold, with accessory refrigerator.
- r. One microwave oven.

5. Services:

- a. Lighting: 50 foot-candles at desk top height.
- b. Exterior lighting at entrance door.
- c. Automatic heating and mechanical cooling equipment sufficient to maintain comfort conditions.
- d. Minimum of ten 110-volt duplex electric convenience outlets, at least one on each wall.
- e. Electric distribution panel: Six circuits minimum, 125-amp, 60-hertz service.
- f. Speaker Phone Telephones (two (2) push-button type): one direct line with local and long-distance access and one answering machine to receive and record incoming calls.
- g. Equip washroom with flush toilet, wash basin with two faucets, toilet tissue holder, 10-gallon capacity automatic electric water heater, and paper towel holder.
- h. Provide potable water service to all trailer fixtures.
- i. Provide a single water discharge to nearest approved sanitary facilities.
- j. Furnish maintenance contracts for service and repair of facsimile and duplicating machines effective for duration of the project.
- k. Provide fire insurance extended coverage and vandalism, malicious mischief, and burglary and theft insurance coverage for trailer contents furnished by the Engineer in the amount of \$5,000. Provide proof of coverage.

C. Contractor's Office and Facilities:

- 1. Size: As required for general use and to provide space for project meetings.
- 2. Lighting and temperature control: As specified for the Engineer's office.
- 3. Racks and files for Project Record Documents.
- 4. One 10-inch outdoor-type thermometer with daily maximum and minimum observed temperature indicators.
- 5. One rain gauge.

6. Two (2) six-foot (6') conference tables, 14 folding chairs.

- D. The Contractor shall make all provisions and pay all installations and other costs for the Engineer's Representative's construction office in order to provide water, sewer, telephone service (local and long distance and unlimited internet access), power service, and exterior lights at the project site available for the Engineer's use. The Contractor shall pay all monthly charges for the various services provided to the Engineer's office throughout the construction period and for a minimum of 30 days after final completion.

1.04 USE OF PERMANENT FACILITIES

- A. Permanent facilities shall not be used for field offices or for storage.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. May be new or like-new, but must be serviceable, adequate for required purpose, and must not violate applicable codes or regulations.

PART 3 EXECUTION

3.01 PREPARATION

- A. Fill and grade sites for temporary structures to provide surface drainage.
- B. Install and maintain a gravel parking area in front of Engineer's trailers for up to ten (10) vehicles.

3.02 INSTALLATION

- A. Have office equipped and ready for use 15 days before work begins at the site.
- B. Construct temporary field offices on proper foundations, provide connections for utility services.
1. Secure portable or mobile buildings when used.
 2. Install stairs, 5' x 5' platform porch, and handrails at each exterior door.
- C. Mount thermometer and rain gauge at convenient outside locations. Thermometer should not be mounted in direct sunlight. Rain gauge should be mounted vertically and should be located sufficient distance (two times the height of the tallest structure or natural feature) from structures or other wind breaks. Keep the rain gauge free of debris and obstructions.
- D. Locate construction office facilities at the location acceptable to the Engineer and Owner within the project area.

3.03 MAINTENANCE AND CLEANING

- A. Furnish, replace and replenish light bulbs, fluorescent tubes, bottled water, cups, toilet paper, paper towels, soap and other things required to maintain the office.
- B. Wash floor and clean washroom fixtures at least once each week. Wash windows when needed or when requested by Engineer. Sweep floor and dust furnishings daily.
- C. Maintain office in first class condition for the duration of the project.

3.04 REMOVAL

- A. Remove temporary field offices, contents and services at a time when no longer needed.
- B. Remove foundations and debris; grade site to required elevations and clean the areas.

3.05 INSTALLATION AND MAINTENANCE OF COMMUNICATIONS/INTERNET

- A. Installation of communications/internet equipment in the Engineer's field office shall be done in accordance with the manufacturer's recommendations and instructions.
- B. Furnish the services of a qualified service technician to supervise installation of equipment, and to check the operation of the equipment upon satisfactory installation.
- C. Furnish a maintenance contract for service and repair of the equipment, effective for the duration of the project and for 30 days after the final completion.

END OF SECTION 01590

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Material and equipment incorporated into the Work:
 - 1. Conform to applicable specifications and standards.
 - 2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Engineer.
 - 3. Manufactured and Fabricated Products
 - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - c. Two or more items of the same kind shall be identical, by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
 - 4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 RELATED REQUIREMENTS

- A. Section 00700: General Conditions
- B. Section 01010: Summary of Work
- C. Section 01041: Project Coordination
- D. Section 01300: Submittals
- E. Section 01630: Product Options and Substitutions
- F. Section 01710: Cleaning
- G. Section 01730: Operation and Maintenance Data

H. Section 01740: Warranties and Bonds

1.03 APPROVAL OF MATERIALS

- A. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and approval of the Engineer. No material shall be incorporated into the work without prior approval of the Engineer.
- B. The Contractor shall submit data and samples sufficiently early to permit consideration and approval before materials are necessary for incorporation in the work. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of claim against the Owner or the Engineer.
- C. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, the Contractor shall provide such samples of workmanship or finish as may be required.
- D. The materials and equipment used on the work shall correspond to the approved samples or other data.

1.04 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including five copies to the Engineer.
 - 1. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
 - 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.05 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.
- B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.06 STORAGE AND PROTECTION

- A. The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry, noncorrosive environment for all mechanical equipment, valves, and special equipment and materials to be incorporated into this project. Storage of materials shall be in strict accordance with the "instructions for storage" of each supplier and manufacturer. The Contractor shall furnish a copy of the manufacturer's instructions for storage to the Engineer prior to storage of all equipment and materials. Corroded, damaged or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.
- B. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible.
1. Store products subject to damage by the elements in weathertight enclosures.
 2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
 3. Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
 4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- C. All materials and equipment to be incorporated in the work shall be handled and stored by the Contractor before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.
- D. Cement, sand and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking, and spalling to a minimum.
- E. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work, and the Contractor shall receive no compensation for the damaged material or its removal.

- F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.
- G. Protection After Installation
 - 1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.
- H. The Contractor shall be responsible for all material, equipment, and supplies sold and delivered to the Owner under this Contract until final inspection of the work and acceptance thereof by the Owner. In the event any such material, equipment, and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.
- I. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from any amounts due and payable to the Contractor. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary corrections.

1.07 SPECIAL TOOLS

- A. Manufacturers of equipment and machinery shall furnish any special tools required for normal adjustment, operations and maintenance, together with instructions for their use. The Contractor shall preserve and deliver to the Owner these tools and instructions in good order upon receipt but no later than ten (10) days prior to equipment start-up.

1.08 STORAGE AND HANDLING OF EQUIPMENT ON SITE

- A. Because of the long period allowed for construction, special attention shall be given to the storage and handling of equipment on site. As a minimum, the procedure outlined below shall be followed.
 - 1. Equipment shall not be shipped until approved by the Engineer. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer. Operation and Maintenance Data as described in Section 01730 shall be submitted to the Engineer for review prior to shipment of equipment.
 - 2. All equipment having moving parts such as gears, electric motors, etc. and/or instruments shall be stored in a temperature and humidity controlled building approved by the Engineer, until such time as the equipment is to be installed.

3. All equipment shall be stored fully lubricated with oil, grease, etc. unless otherwise instructed by the manufacturer.
4. A copy of the manufacturer's storage instructions shall be given to the Engineer and shall be carefully studied by the Contractor and reviewed with the Engineer by him. These instructions shall be carefully followed and a written record of this kept by the Contractor.
5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. Mechanical equipment to be used in the work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to the Owner.
7. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.09 WARRANTY

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer as specified in Section 01740.

1.10 SPARE PARTS

- A. The Contractor shall collect and store all spare parts as required by the manufacturer in accordance with Paragraph 1.08 of this Section. In addition, the Contractor shall furnish to the Engineer an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier, and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivered cost. The Contractor shall deliver the spare parts to the Owner not more than thirty (30) nor less than ten (10) days prior to leachate pretreatment system and pump station start-up.
- B. All spare parts shall be the products of the original equipment manufacturer.

1.11 GREASE, OIL, AND FUEL

- A. All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer, and approved by the Owner, with

each item of equipment supplied under Divisions 11, 12, 13, 14, 15 and 16. Refer to paragraph 2.01 for additional requirements for lubricants.

- B. The Contractor shall be responsible for furnishing and changing the oil in all drives and intermediate drives of each piece of mechanical equipment after initial break-in of the equipment, which in no event shall be any longer than three weeks of operation.

PART 2 PRODUCTS

2.01 LUBRICANTS

- A. All lubricants furnished on this Project shall be 100 percent paraffin-based lubricants, that contain Monolec or Amosol, such as the products offered by Lubrication Engineers, Inc. (LE), Fort Worth, TX. Only LE lubricants, or approved equal paraffin-based lubricants shall be used for factory testing of equipment. In the event that other lubricants are used for factory testing or furnished with the delivered equipment, the Contractor shall be responsible for draining, flushing and replacing the unapproved lubricants with acceptable products. Shop drawings shall indicate the manufacturer's recommended LE products, or proposed equal.

PART 3 EXECUTION (Not Used)

END OF SECTION 01600

SECTION 01625

START-UP

PART 1 GENERAL

1.01 GENERAL

- A. The start-up requirements presented herein are for the mechanical, plumbing, electrical, and instrumentation systems. Prior to requesting issuance of the certificate of substantial completion, start-up shall be completed as specified herein.
- B. All equipment shall be tested and approved by the Owner prior to placing the facilities into operation.
- C. All lubricants, fuel, and power necessary for initial operation and tests shall be furnished by the Contractor.
- D. In addition to furnishing, delivering, installing, and testing equipment, the Contractor shall provide the services of competent manufacturing representatives for the periods indicated in other sections of these Specifications. Such representatives shall assist the Owner's personnel during start-up by instructing the operating personnel of the Owner in the maintenance and operation of the equipment, conducting tests, and making recommendations for producing the most efficient results. These services shall be provided during the initial operation of the completed facilities and be over and above any services necessary during erection or to correct defective materials or workmanship during the guarantee period. These representatives shall be specially trained and qualified for installation, adjustment, start-up, and testing work and shall not be sales representatives only. The cost of such representation, including subsistence and travel, shall be included under this Contract.

PART 2 MATERIALS (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.
- D. Preparation for Start-Up:
 - 1. Upon completion of the facility and all its related systems, all process systems and pipe lines shall be filled and flushed with water and hydraulically checked for leaks, cracks, and defects. All sumps, tanks, basins, chambers, dry-pit, and wet well which under normal operating conditions will contain water or process liquids shall also be hydraulically checked using water for leaks, cracks, and defects.
 - 2. All mechanical and electrical equipment shall be checked to ensure that it is in good working order and properly connected. Preliminary run-ins of the various pumps, compressors, and other remaining equipment shall be made. All systems shall be purged as required. All sumps, tanks, basins, chambers, dry-pit, wet well, and pipe lines which are hydraulically checked shall be drained and returned to their original condition once the water testing is complete.
 - 3. All instruments and controls shall be calibrated through their full range. Any other adjustments required for proper operation of all instrumentation and control equipment shall be made.
 - 4. The Contractor shall perform all other tasks needed for preparing and conditioning the facility for proper operation.

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 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 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 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.

END OF SECTION 01625
(Form to follow)

MANUFACTURER'S CHECK-OUT CERTIFICATION

OWNER: _____
ENGINEER: SCS Engineers
ARCHITECT: _____
CONTRACTOR: _____
OWNER: Buncombe County

No. Copies 5
No. Copies 1 Date _____
No. Copies _____
No. Copies _____
No. Copies _____

PROJECT DATA

Name: _____
Number: _____
Location: _____
Owner: _____
Other: _____

CONTRACT DATA

Number: _____
Date: _____
Drawing No.: _____
Specification Section: _____

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 reviewed 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

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings on the paper.

DEMONSTRATION TEST PROCEDURES (SAMPLE)

PROJECT DATA

Name: _____
Number: _____
Location: _____
Owner: _____
Other: _____

CONTRACT DATA

Number: _____
Date: _____
Drawing No.: _____
Specification Section: _____

TEST AREA: _____

TEST DESCRIPTION: _____

	DATE VERIFIED	VERIFIED BY
1. Pump Capacity Verification		
A. Shutoff Head - Record pressure of each pump under dead head conditions (pump against closed valve).		
Pump 1 ____ psig (actual) _____ psig (expected)	_____	_____
Pump 2 ____ psig (actual) _____ psig (expected)	_____	_____
B. Pump-down test for each pump from wetwell with valve open. Ten-minute runs at steady pressure after flow has been fully establish.		
Pump 1 ____ gpm (calculated) _____ psig	_____	_____
____ gpm (from cert. curve @ above pressure)	_____	_____
Pump 2 ____ gpm (calculated) _____ psig	_____	_____
____ gpm (from cert. curve @ above pressure)	_____	_____
C. Flowmeter verification		
____ gpm (calculated)	_____	_____
____ gpm (reading)	_____	_____
D. Pump valve operation observed	_____	_____
E. Pump control functions observed:		
1. Hand mode	_____	_____
2. Auto mode (level control)	_____	_____

CERTIFICATE OF COMPLETED DEMONSTRATION

OWNER: _____
ENGINEER: SCS Engineers
ARCHITECT: _____
CONTRACTOR: _____
OWNER: Buncombe County

No. Copies 5
No. Copies 1 Date _____
No. Copies _____
No. Copies _____
No. Copies _____

PROJECT DATA

Name: _____
Number: _____
Location: _____
Owner: _____
Other: _____

CONTRACT DATA

Number: _____
Date: _____
Drawing No.: _____
Specification Section: _____

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.
- 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)

SECTION 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish and install Products specified, under options and conditions for substitutions stated in this Section.
- B. Whenever a product, material or item of equipment is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, followed by the phrase "or equal," the specific item mentioned shall be the basis upon which bids are to be prepared, and shall be understood as establishing the type, function, dimension, appearance and quality desired. Other manufacturer's or vendor's products not named will be considered as substitutions, provided the required information is submitted in the manner set forth in this section and provided the substitution will not require substantial revision to the Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Section 00100: Instruction to Bidders
- B. Section 00300: Bid Form
- C. Section 00700: General Conditions
- D. Section 01036: Change Order Procedures
- E. Section 01600: Material and Equipment

1.03 CONTRACTOR'S OPTIONS

- A. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with Specifications.
- B. For products specified by naming one or more products or manufacturers and stating "or equal," submit a request as for substitutions, for any product or manufacturer which is not specifically named.
- C. For products specified by naming only one product and manufacturer, there is no option and no substitution will be allowed.

1.04 SUBSTITUTIONS

- A. In order for substitutions to be considered, the Contractor shall submit, within 30 days of issuance of Notice of Award, complete data as set forth herein to permit complete analysis of all

proposed substitutions noted on his/her substitutions list. No substitution shall be considered unless the Contractor provides the required data in accordance with the requirements of this Section within the 30-day period.

- B. Submit separate request (see request form) for each substitution. Support each request with:
1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature; identify:
 - 1) Product description.
 - 2) Reference standards.
 - 3) Performance and test data.
 - 4) Operation and maintenance data.
 - c. Samples, as applicable.
 - d. Name and address and contact with phone number of similar projects on which product has been used and date of each installation.
 2. Itemized comparison of the proposed substitution with product specified; list significant variations. Substitution shall not change design intent and shall perform equal to that specified.
 3. Data relating to impact on construction schedule occasioned by the proposed substitution.
 4. Any effect of substitution on separate contracts.
 5. List of changes required in other work or products.
 6. Accurate cost data comparing proposed substitution with product specified.
 - a. Amount of any net change to Contract Sum.
 7. Designation of required license fees or royalties.
 8. Designation of availability of maintenance services, sources of replacement materials.
- C. Substitutions will not be considered for acceptance when:
1. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor.

2. They are requested directly by a subcontractor or supplier.
 3. Acceptance will require substantial revision of Contract Documents.
- D. The Engineer's decision regarding evaluation of substitutions shall be considered final and binding. Requests for time extensions and additional costs based on submission of, acceptance of, or rejection of substitutions will not be allowed. All approved substitutions will be incorporated into the Agreement by Change Order.

1.05 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution, Contractor represents that:
1. He has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
 2. He will provide same warranties or bonds for substitution as for product specified.
 3. He will coordinate installation of accepted substitution into the Work and will make such changes as may be required for the Work to be complete in all respects.
 4. He waives claims for additional costs caused by substitution which may subsequently become apparent.
 5. Cost data is complete and includes related costs under his/her Contract, but not:
 - a. Costs under separate contracts.
 - b. Engineer's costs for redesign or revision of Contract Documents.

1.06 ENGINEER DUTIES

- A. Review Contractor's requests for substitutions with reasonable promptness.
- B. Notify Contractor, in writing, of decision to accept or reject requested substitution.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01630

SUBSTITUTION REQUEST

PROJECT: _____ DATE: _____

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:

<u>Specified Product</u>	<u>Substitution</u>
Name, brand: _____	_____
Catalog No.: _____	_____
Manufacturer: _____	_____
Vendor: _____	_____
Significant variations: _____	_____

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:

- 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: _____

Resubmit with additional information: _____

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: _____

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.02 RELATED REQUIREMENTS

- A. Section 00700: General Conditions
- B. Section 01027: Application for Payment
- C. Section 01710: Cleaning
- D. Section 01720: Project Record Documents
- E. Section 01730: Operation and Maintenance Data
- F. Section 01740: Warranties and Bonds
- G. The respective sections of Specifications: Closeout Submittals Required of Trades, Vendors, Suppliers, and Manufacturers.

1.03 PRELIMINARY SUBMISSIONS

- A. Operating and Maintenance Submission at 85% billing.
 - 1. Submit the following for approval prior to submitting an application for payment that shows the work 85% complete and prior to requesting a final review for certification of Substantial Completion:
 - a. Bind operation and maintenance manuals, mechanical, electrical and plumbing operation diagrams and specific warranties in triplicate.
 - b. Bind all documents in heavy-duty 3 ring binders.
 - c. Type identifying labels behind clear plastic on edge of binder.
 - d. Organize contents with marked laminated, reinforced index tabs in 16 Division format.
 - e. Include typed table of contents.
- B. Shop Drawings for Owner

1. Submit, also at 85% billing, a complete set of legible Contractor's approved, Engineer reviewed, shop drawings folded up in reinforced cardboard file storage boxes. Organize using expandable file folder pouches. Index pouch tabs with each specification section's submission numerically, beginning with Division 1. Include typed listing of all Shop Drawings in transmittal boxes.

1.04 SUBSTANTIAL COMPLETION

- A. When Contractor considers the Work substantially complete, he shall submit to the Engineer:
 1. A written notice that the Work, or designated portion thereof, is substantially complete including all required surveys and record drawings.
 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.
- C. Should the Engineer determine that the Work is not substantially complete:
 1. The Engineer will promptly notify the 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 the Engineer.
 3. The Engineer will reinspect the Work.
- D. When the Engineer finds that the Work is substantially complete, he will:
 1. Prepare and deliver to Owner a tentative Certificate of Substantial Completion (EJCDC format), with a tentative list of items to be completed or corrected before final payment.
 2. After consideration of any objections made by the Owner as provided in the Conditions of the Contract, and when the Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

1.05 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. Equipment and systems have been tested in the presence of the Owner's representative and

are operational.

5. 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 the Engineer consider that the Work is incomplete or defective:

1. The 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 the 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.

1.06 REINSPECTION FEES

A. Should the Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the 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.

1.07 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. Operation and Maintenance Data, Instructions to Owner's Personnel: To requirements of Section 01730.

D. Warranties and Bonds: To requirements of Section 01740.

E. Tools, Spare Parts and Maintenance Materials: To requirements of Section 01730.

F. Evidence of Payment and Release of Liens: To requirements of General Conditions.

1.08 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
 - b. Allowances
 - c. Unit Prices
 - d. Deductions for uncorrected Work
 - e. Deductions for liquidated damages
 - f. Deductions for reinspection payments
 - g. Other adjustments
 - h. Inspection Overtime
 - i. Excessive shop drawing review cost by Engineer
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.

1.09 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

3.01 GENERAL

- A. The Contractor shall furnish all necessary tools and labor required to allow Engineer and Owner to verify the status of completion. The tools shall include, but not be limited to, the following:

1. Manhole/vault entry equipment
2. Locator for services
3. Fire hydrant wrench and fire hose
4. Shovel
5. Lamps and mirrors
6. Probe rod
7. Valve key
8. Manhole hook

END OF SECTION 01700

SECTION 01710

CLEANING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by General Conditions.

1.02 RELATED REQUIREMENTS

- A. Section 00700: General Conditions
- B. Each Specification Section: Cleaning for specific Products or work.

1.03 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown trash or debris, resulting from waste excavation and other construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish.
- C. Remove waste materials, debris and rubbish from the site periodically (at a minimum of once every seven (7) days) and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.
- C. Control dust from operations as needed and requested by the Owner.

3.03 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other foreign materials from sight-exposed interior and exterior surfaces.
- C. Remove temporary protection and facilities installed for protection of the Work during construction.
- D. Wash and shine glazing and mirrors.
- E. Polish glossy surfaces to a clear shine.
- F. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- G. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire Work is clean.

END OF SECTION 01710

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor shall maintain at the site for the Owner one record copy of:

1. Drawings
2. Specifications
3. Addenda
4. Change Orders and other modifications to 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
9. Detailed progress schedule

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.

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 and provide currently updated "Record Drawings" for review by the Engineer and Owner.

1.03 AUTOCAD UPDATE

- A. Provide AutoCAD update by standards for Record Drawings which will be designated by the Engineer.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" or "RECORD DRAWING" as applicable, with month and year in large bold letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.
 - 2. Mark record sets with red felt tip marker; use other colors to distinguish between variations in separate categories of the Work.
 - 3. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 - 4. Note related Change Order numbers where applicable.
 - 5. Organize record drawing sheets, as approved by Engineer, into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each sheet.
- C. Drawings; AutoCAD update to record actual construction (complete set):
 - 1. Elevations of various structure elements in relation to grade.
 - 2. All underground piping with elevations and dimensions. Changes 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. Mechanical and electrical changes.
 - 5. Major grading, roadway, and structural changes.
 - 6. All underground duct banks with elevations and dimensions, horizontal and vertical locations of underground duct banks, and manholes along duct banks.
 - 7. All underground cable elevations and horizontal locations of underground cables.
 - 8. Field changes of dimension and detail.
 - 9. Changes made by Field Order or by Change Order.

10. Details not on original Contract Drawings.

D. Specifications and Addenda; Provide one complete set and 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):

1. One complete set of record drawings.

F. See requirements of 01050, 1.03C.

1.05 SUBMITTAL

A. At Contract Substantial Completion, deliver Record Documents to the Engineer for the Owner.

B. Submit one (1) set of specifications and addenda, and Shop Drawings, in accordance with Paragraph 1.04 D. and E., of this section, prior to Final Completion.

C. 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

D. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the Owner's records.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01720

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.
- B. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
- C. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

1.02 RELATED WORK

- A. Section 01041: Project Coordination
- B. Section 01300: Submittals
- C. Section 01700: Contract Closeout
- D. Section 01720: Project Record Documents
- E. Section 01740: Warranties and Bonds

1.03 SERVICES OF MANUFACTURERS' REPRESENTATIVE

- A. Equipment, when furnished, shall include the cost of a competent representative of the manufacturers of all equipment to supervise the installation, adjustment, and testing of the equipment and to instruct the Owner's operating personnel on operation and maintenance. This supervision may be divided into two or more time periods as required by the installation program or as directed by the Engineer.
- B. See the detailed Specifications for additional requirements for furnishing the services of manufacturer's representatives.
- C. For equipment furnished under other Divisions, the Contractor shall furnish the services of accredited representatives of the manufacturer only when some evident malfunction or overheating makes such services necessary in the opinion of the Engineer.

1.04 OPERATING MANUALS

- A. Six complete sets of operation and maintenance instructions covering all equipment furnished shall be delivered to the Engineer.

1. The manual for each piece of equipment shall be a separate document with the following specific requirements:

- a. Contents:

Table of contents and index

Brief description of each system and components

Starting and stopping procedures

Special operating instructions

Routine maintenance procedures

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

One copy of each wiring diagram

One copy of each approved shop drawing and each Contractor's coordination and layout drawing

List of spare parts, manufacturer's price, and recommended quantity

Name, address and telephone numbers of local service representatives.

- b. Material:

- (1) Binders: For each manual, provide heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2- by 11-inch paper. Provide a clear plastic sleeve on the spine, to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

- (a) Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

- (b) Identify each binder on the front and spine, with typed and printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate the volume number for multiple volume sets of manuals.

- (2) Dividers: Provide heavy paper dividers with laminated tabs identifying each separate Section. Mark each tab to indicate contents. Provide a typed description

of the product and major parts of equipment included in the Section of each divider.

- (3) Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
- (4) Text Manual: Where written material is required as part of the manual use the Manufacturer's standard printed material, or if it is not available, specially prepared date, neatly typewritten, an 8-1/2" by 11", 20-pound white bond paper.
- (5) Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.
 - (a) Where oversized drawings are necessary, fold the drawings to the same size as the text pages and use as a fold-out.
 - (b) If drawings are too large to be used practically as a fold-out, place the drawing, neatly folded, in the front or rear pocket of the binder, insert a typewritten page indicating the drawing title, description of contents and drawing location at the appropriate location in the manual.

c. Submittals to the Engineer:

- (1) Three preliminary copies of manuals shall be submitted to the Engineer no later than 15 days following approval of the shop drawings for each piece of equipment. Provide six final copies of complete manuals prior to testing.

1.05 CONTENTS, EACH VOLUME

- A. Table of Contents: Provide title of Project, names, addresses, and telephone numbers of Engineer, subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers; including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified.
- F. Warranties and Bonds are as specified in Section 01740.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. For each Item of Equipment and each System provide the following:
1. Overview of System and description of unit or system, and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.
 2. Panelboard Circuit Directories including electrical service characteristics, controls and communications, and color-coded wiring diagrams as installed.
 3. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences; regulation, control, stopping, shut-down, and emergency instructions; and summer, winter, and any special operating instructions.
 4. Maintenance Requirements:
 - a. Routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - b. Servicing and lubrication schedule, and list of lubricants required.
 - c. Manufacturer's printed operation and maintenance instructions.
 - d. Sequence of operation by controls manufacturer.
 - e. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 5. Control diagrams by controls manufacturer as installed.
 6. Contractor's coordination drawings, with color coded piping diagrams as installed.
 7. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 8. List of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 9. Test and balancing reports as specified.
 10. Additional Requirements: As specified in individual product specification Sections.

1.07 INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon time. The Contractor shall have instructions video-taped while they are being given to Owner's personnel. Video taping shall be performed by a person or organization experienced in the

production of videos and shall include the entire instruction session(s) and all questions and answers. Digital copies shall become the property of the Owner.

- B. Use Operation and Maintenance Manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01730

SECTION 01740

WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1.02 RELATED WORK

- A. Section 00100: Instructions to Bidders
- B. Section 00700: General Conditions
- C. Section 01041: Project Coordination
- D. Section 01700: Contract Closeout
- E. Section 01730: Operation and Maintenance Data
- F. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections.
- G. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

1.03 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.

D. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.

E. Schedule of Special Warranties

1. Section 02271 – Fabrics Cushion
2. Section 02272 – Filter Fabric
3. Section 02276 – Erosion and Sedimentation Control
4. Section 02277 – Geosynthetic Clay Liner (GCL)
5. Section 02623 – High Density Polyethylene (HDPE) Pipe
6. Section 02776 – High Density Polyethylene (HDPE) Geomembrane
7. Section 11323 – Submersible Riser Pumps

1.04 WARRANTY REQUIREMENT

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

- G. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.05 FORM OF SUBMITTALS

- A. Prepare and submit four hard copies.
- B. Format:
 - 1. Size 8.5-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.

1.06 DEFINITIONS

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01740

DIVISION 2

SITE WORK

SECTION 02100
SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, and equipment required and perform all site preparation, complete as shown on the Drawings and as specified herein.
- B. Obtain all permits required for site preparation work prior to proceeding with the work, including clearing and tree removal.
- C. Contractor shall only clear and grub areas that have erosion and sedimentation control measures installed and capable of handling sediment runoff from disturbed areas. Contractor shall minimize the amount of clearing and grubbing during installation of the erosion and sedimentation control measures.

1.02 RELATED WORK

- A. Section 02200: Excavation, Backfill, and Compaction
- B. Section 02276: Erosion and Sedimentation Control
- C. Section 02985: Seeding and Mulching

1.03 SUBMITTALS

- A. Submit copies of all permits required prior to clearing work.
- B. Contractor shall supply an actual limits of clearing and/or grubbing survey certified by a Professional Land Surveyor in accordance with Section 01050.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 SURVEY

- A. The Contractor shall stake out the limits of the clearing and/or grubbing necessary to complete all work associated with this Contract.

3.02 CLEARING AND GRUBBING

- A. Cut and remove timber, trees, stumps, brush, shrubs, roots, grass, weeds, rubbish, and any other objectionable material resting on or protruding through the surface of the ground.

- B. Grub and remove all stumps, roots in excess of 1-1/2 inches in diameter, matted roots, brush, timber, logs, concrete rubble, and all other debris encountered to a minimum of 18 inches below subgrade elevation, or as directed by Engineer.
- C. All grubbing holes and depressions excavated below the original ground surface shall be backfilled with common fill and compacted to a density conforming to the surrounding ground surface.
- D. Trees, wetlands, and other vegetation designated on the Drawings or directed by the Engineer to remain shall be preserved and protected as specified.

3.03 VEGETATION AND TOPSOIL REMOVAL

- A. Remove all topsoil and vegetation within the cut and fill sections of the limits of construction to a maximum of 12 inches, or as directed by the Engineer. Topsoil and vegetation shall not be stockpiled with soil stockpiles and piled in a location as directed by the Engineer.

3.04 DISPOSAL

- A. The Contractor shall dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris to an approved facility.
- B. On-site disposal of cleared and grubbed materials by open-air burning may be allowed provided the Contractor obtains the proper permits in advance.

3.05 PROTECTION

- A. Trees, wetlands, and other vegetation directed by the Engineer to remain shall be protected from damage by all construction operations by erecting suitable barriers, guards, and enclosures, or by other approved means. Clearing operations shall be conducted in a manner to prevent falling trees from damaging trees and vegetation designated to remain and to the work being constructed and so as to provide for the safety of employees and others.
- B. Protection shall be maintained until all work in the vicinity of the work being protected has been completed.
- C. Heavy equipment operation or stockpiling of materials shall not be permitted within the branch spread of existing trees.
- D. Any damage to existing tree crowns, trunks, or root systems shall be repaired immediately. Roots exposed and/or damaged during the work shall immediately be cut off cleanly inside the exposed or damaged area. Cut surfaces shall be treated with an acceptable tree wound paint, and topsoil spread over the exposed root area.
- E. When work is completed, all dead and downed trees shall be removed. Live trees shall be trimmed of all dead and diseased limbs and branches. All cuts shall be cleanly made

at their juncture with the trunk or preceding branch without injury to the trunk or remaining branches. Cuts over 1-inch in diameter shall be treated with an acceptable tree wound paint.

- F. Construction activities shall be restricted to those areas within the limits of construction designated on the Drawings, within public rights-of-way, and within easements provided by the Owner. Adjacent properties and improvements thereon, public or private, which become damaged by construction operations shall be promptly restored to their original condition, to the full satisfaction of the property owner.

END OF SECTION 02100

SECTION 02200

EXCAVATION, BACKFILL, AND COMPACTION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, compaction and grading required to complete the work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to: excavation, obtaining and hauling fill/backfill materials, filling/backfilling, grading, compaction, placing clay, disposal of waste and surplus materials, placing crushed stone, constructing of berms, and all related work such as stable slope construction, sheeting, shoring, bracing, and dewatering.
- B. All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards 29 CFR Part 1926.650 Subpart P and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- C. Topsoil, if any, and excess cut material will be stockpiled in locations approved by the Engineer.
- D. During earthwork at the C&D Landfill, Phase 7, the Owner may elect to require specific work hours and/or days as to not interfere with landfill operations.

1.02 RELATED WORK

Related work includes, but is not limited to, the following:

- A. Section 01410 – Testing and Laboratory Services
- B. Section 02100 – Site Preparation
- C. Section 02276 – Erosion and Sedimentation Control
- D. Section 02278 – Compacted Soil Liner
- E. Section 02505 – Crushed Stone Paving
- F. Section 02576 – Asphalt Paving
- G. Section 02623 – High Density Polyethylene (HDPE) Pipe
- H. Section 02700 – Protective Cover Aggregate
- I. Section 02776 – High Density Polyethylene (HDPE) Geomembrane
- J. Section 02985 – Seeding and Mulching

1.03 REFERENCE STANDARDS

Reference standards include, but are not limited to, the following:

A. American Society for Testing and Materials (ASTM)

1. ASTM C33 - Standard Specification for Concrete Aggregates
2. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils
3. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (ft-lbf/ft³ (600 kN-m/m³))
4. ASTM D854 - Standard Test Method for Specific Gravity of Soil Solids by Water Pycnometer
5. ASTM D1140 - Standard Test Method for Amount of Material in Soils Finer than the Number 200 (75 micrometer) Sieve
6. ASTM D1556 - Standard Test Method for Density and Limit Weight of Soil in Place by the Sand Cone Method
7. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
8. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
9. ASTM D2487 - Standard Test Method for Classification of Soils for Engineering Purposes
10. ASTM D2488 - Practice for Description and Identification of Soils (Visual-Manual Procedure)
11. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Method (Shallow Depth)
12. ASTM D2937 - Standard Test Method for Density of Soil in Place by Drive Cylinder Method
13. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Method (Shallow Depth)
14. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 SUBMITTALS

- A. Furnish the Engineer a representative sample weighing approximately 50 pounds of each stone bedding material, structural fill, select fill, common fill, backfill aggregate, and ABC stone contained in sealed 5-gallon containers, at least 30 calendar days prior to the date of anticipated use of such material for approval, in accordance with Section 01410.
- B. If required by OSHA guidelines, excavation and excavation support designs shall be prepared by a licensed Professional Engineer, registered in the State of North Carolina, having a minimum of five years of professional experience in the design and construction of excavations and excavation support systems. Submit an original and three copies of the licensed Professional Engineer's certification, on the PE certification form attached to Section 01300, stating that the excavation support systems designs have been prepared by the Professional Engineer, are consistent with the proposed dewatering and drainage systems, and that the Professional Engineer will be responsible for their execution.
- C. Dewatering and drainage system designs shall be prepared by a licensed professional engineer, registered in the State of North Carolina, having a minimum of five years of professional experience in the design and construction of dewatering and drainage systems. Submit an original and three copies of the licensed professional engineer's certification, on the PE form specified in Section 01300, stating that the dewatering and drainage system designs have been prepared by the professional engineer and that the professional engineer will be responsible for their execution. Do not submit dewatering and drainage system designs unless requested in writing by the Engineer.

1.05 PROTECTION

- A. Sheeting and Bracing (if required)
 - 1. Furnish, install, and maintain such sheeting and bracing as may be required by Federal, State and local safety requirements 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 from undermining or other damage. If the Engineer is of the opinion that at any location sufficient or proper supports have not been provided, he/she may order additional supports put in, and compliance with such order shall not relieve or release the Contractor from his/her 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. All voids shall be filled to the satisfaction of the Engineer.
 - 2. Construct the sheeting outside the neat lines of the foundation or excavation, unless indicated otherwise, to the extent deemed desirable for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected to provide the necessary clearances and dimensions.
 - 3. All sheeting and bracing shall be carefully removed in such manner as not to endanger the

construction or other structures, utilities, or property. The Contractor's excavation support system designer shall provide direction for the abandonment of excavation support systems in such a manner that existing/proposed improvements are not damaged due to abandonment/removal activities. Such direction shall include cut-off elevations, elements to remain-in-place, removal procedures, etc. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand, which must be approved by the Engineer, by ramming with tools especially adapted to that purpose, or otherwise as may be directed.

4. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his/her part to issue such orders and his/her failure to exercise his/her 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.
5. No sheeting is to be withdrawn if driven below mid-diameter of any pipe and under no circumstances shall any sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Drainage and Dewatering

1. Dewatering shall be performed as specified during the excavation of organic materials and unstable soils from the site. Dewatering is expected to be required during the excavation and filling of ponds, ditches and where the topsoil layer extends below the water table.
2. At all times during construction, provide and maintain proper equipment and facilities to remove all water entering excavations and 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 into the excavated areas. Groundwater shall be lowered to at least 2 feet below the bottom of the excavations.
3. 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. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.
4. Surface runoff shall be diverted from open excavations to maintain a bottom free from standing water.
5. Dewatering of wetlands or ditches filled with water shall be performed in such a manner as to control discharge water by use of sediment basins and/or check dams or other erosion control structures approved by the Land Quality Section of NCDEQ.
6. Take all additional precautions to prevent uplift of any structure during construction.
7. Drainage shall be disposed of so that flow or seepage back into the excavated area will be prevented. Drainage shall be disposed of in an approved area in accordance with regulatory requirements.

8. Flotation shall be prevented 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.
9. Remove the dewatering equipment after the system is no longer required.
10. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater or surface water quality.
11. Discharge from dewatering and drainage operations shall be controlled to prevent adverse effects on Owner's and neighboring property.

1.06 SOIL TESTING

- A. The Owner will engage a Quality Control Laboratory (QCL) for the quality control testing during earthwork operations in accordance herein.
- B. During earthwork, the Contractor shall provide assistance and access and coordinate his work with the Owner's QCL Representative to allow testing and monitoring of all work components to proceed.
- C. There shall be no additional compensations to Contractor for any construction delays caused by Contractor's failure to plan, coordinate, and schedule work to include all CQA activities.
- D. Quality control testing includes all conformance testing and field density testing at the stated frequencies. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer, will be borne by the Contractor.
- E. Conformance testing requirements are specified in Paragraph 2.02.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials for use as fill shall be as described below. The Contractor shall notify the Engineer of the source of each material. Materials shall be furnished from on-site grading and/or as required from approved off-site sources and hauled to the site.
- B. Common Fill shall consist of soil free of organic materials, loam, wood, trash, topsoil, highly micaceous silt, debris or other deleterious materials which will deteriorate in time or which cannot be properly compacted. Common fill shall not contain stones larger than six inches in diameter and shall have a maximum of 75 percent passing the No. 200 sieve, a maximum liquid limit of 50, and a maximum plasticity index of 30. Common fill shall not contain granite blocks, broken concrete, masonry rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice and frozen soil will not be permitted.

Common Fill shall be placed in maximum 8-inch-thick lifts and compacted to 95% of the Standard Proctor (ASTM D698) maximum dry density, or as otherwise shown in the Drawings. Since these soils are moisture sensitive with respect to achieving proper compaction, particular care should be taken to control the moisture content during placement and compaction. The soils shall be wetted or dried as necessary so that the moisture content during compaction is near the optimum moisture content to consistently achieve compaction to 95%. Moisture conditioning and compaction will likely be difficult during rainy or freezing weather due to the high fines content of the material.

- C. Select Fill shall consist of mineral soil free from organic materials, loam, wood, trash or other objectionable materials which may be compressible or which cannot be properly compacted. It shall contain no stones larger than three inches and shall have a maximum of 50 percent passing the number 200 sieve, a maximum liquid limit of 50 percent and a maximum plasticity index of 15 percent. Select Fill shall be placed in maximum 8-inch-thick lifts and compacted to 95% of the Standard Proctor (ASTM D698) maximum dry density, or as otherwise shown in the Drawings. In areas beneath roadways, the top 24-inches of Select Fill shall be compacted to 100% of the maximum dry density of ASTM D698. The soils shall be wetted or dried as necessary so that the moisture content during compaction is less than two percent above the optimum moisture content.

For C&D Landfill, Phase 7, the upper two feet of subgrade shall consist of SC, SM, ML, CL, MH, or CH soils per Unified Soil Classification System.

- D. Structural fill shall consist of a granular soil free of organic materials, loam, wood, trash, topsoil, highly micaceous silt, debris, frozen soil, or other deleterious material which may be compressible or which cannot be properly compacted. Gradation of the structural fill as determined by ASTM D422 shall be within the following limits:

<u>Sieve</u>	<u>Percent Passing by Weight</u>
3-inch	100
No. 4	20 to 90
No. 40	5 to 75
No. 200	0 to 40

Structural fill should have a maximum liquid limit of 40 percent and maximum plasticity index of 10 percent.

- E. Highly micaceous and elastic silts shall not be used for Common, Select or Structural Fill.

F. Rip Rap

1. Provide Plain Rip Rap meeting the requirements of Section 1042 of NCDOT Standard Specifications for Roads and Structures where indicated on the drawings.
2. Unless indicated otherwise on the drawings, Rip Rap shall be a minimum of 24-inches thick.

G. Backfill Stone

All backfill stone shall meet NCDOT requirements where indicated on the drawings.

H. Crushed Stone

All crushed stone shall meet the requirements of Section 1005 of NCDOT Standard Specifications for Roads and Structures. Refer to Section 02505 for Crushed Stone Paving.

I. Protective Cover Aggregate

Refer to Section 02700 for the requirements of protective cover aggregate.

2.02 CONFORMANCE TESTING

- A. Periodic conformance testing shall be conducted by the Owner's Quality Control Laboratory (QCL) on common, select, and structural fill materials prior to their use on the project. The following tests shall be conducted at the indicated frequencies:

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Grain Size	ASTM D422	Every 5,000 cy or change in material
Atterberg Limits	ASTM D4318	Every 5,000 cy or change in material
Moisture/Density	ASTM D698	Every 10,000 cy or change in material
Natural Moisture	ASTM D2216	Every 5,000 cy or change in material

The grain size conformance tests and frequencies listed above also apply to crushed stone.

Results of the tests shall be submitted to the Engineer within 24 hours of test completion and prior to material use on the project. The Engineer reserves the right to reject material based on the results of these conformance tests and/or independent quality assurance testing conducted by the Engineer. Rejected materials shall be removed from the site at no cost to the Owner.

- B. C&D Landfill, Phase 7 fill – QCL will complete the following conformance testing during the installation of the top 2 feet of the landfill subgrade at the specified frequencies.

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Standard Proctor	ASTM D698	Every 3,000 cy or change in material
Atterberg Limits	ASTM D4318	Every 3,000 cy or change in material

Sieve Analysis	ASTM D1140, D7928	Every 3,000 cy or change in material
Moisture Content	ASTM D2216	Every 3,000 cy or change in material
Field Density	ASTM D1556 or D2937 or D6938	1 test/lift/10,000 sf
Natural Moisture Content	ASTM D2216	At every field density test location

C. C&D Landfill, Phase 7 excavation – In areas of soil excavation, at the direction of the Engineer, the Contractor may use the in-situ soil material as the landfill base. The top two feet of any in-situ soils used as the landfill base must also comply with the minimum criteria as outlined in this specification.

1. The upper two feet of the landfill base must consist of the following soil classifications: SC, SM, ML, CL, MH, or CH soils per Unified Soil Classification system.
2. The QCL shall document that the top 24-inches of in-situ soil has been tested for conformance to the construction specifications. The Contractor shall complete 24-inch hand auger test holes and the QCL shall collect soil samples for testing at a maximum frequency of a 100- by 100-foot grid. Auger holes will be repaired by the Contractor. Soil samples will be tested in accordance with the below.



<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Standard Proctor	ASTM D698	100- by 100-foot grid
Atterberg Limits	ASTM D4318	100- by 100-foot grid
Sieve Analysis	ASTM D1140, D7928	100- by 100-foot grid
Moisture Content	ASTM D2216	100- by 100-foot grid
Field Density	ASTM D1556 or D2937 or D6938	100- by 100-foot grid
Natural Moisture Content	ASTM D2216	At every field density test location

PART 3 EXECUTION

3.01 GENERAL EXCAVATION

- A. Excavation shall be made to the grades shown on the Drawings. The bottom of the excavations shall be rendered firm and dry and in all respects acceptable to the Engineer.

- B. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Soils which become soft, loose, "quick", or otherwise unsatisfactory for support of structures, earthen or man-made, as a result of inadequate excavation, dewatering, proofrolling, or other construction methods shall be removed and replaced as required by the Engineer at the Contractor's expense.
- C. Dewatering shall lower the groundwater to at least 2 feet below excavation subgrade and prevent "boiling" condition or detrimental underseepage at the base of the excavation as specified herein.
- D. Excavation equipment shall be satisfactory for carrying out the work in accordance with the Specifications. In no case shall the earth be ploughed, scraped, or dug with machinery so near to the finished subgrade as to result in excavation of, or disturbance of material below grade.
- E. When excavations have reached prescribed grades, the Engineer shall be notified and will inspect the subgrade conditions. If materials or conditions are not satisfactory to the Engineer, the Engineer will issue directions for replacing materials or correcting conditions.
- F. In excavating to subgrade, the Contractor will use care to prevent disturbance and remolding of the subgrade. Material which has become softened and mixed with water shall be removed. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.
- G. All proofrolling shall be conducted in the presence of the Engineer. The Engineer may require excavation and replacement or other remediation as necessary to provide a firm, stable subgrade for paved roads in areas that appear to be rutting, weaving or otherwise appear unstable while proofrolling.

3.02 TRENCH EXCAVATION

- A. Excavation for all trenches required for the installation of pipes shall be made to the depths and grades indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting the trench sides and for pumping and drainage facilities. Contractor shall render the bottom of the excavations firm and stable and in all respects acceptable to the Engineer.
- B. Rock shall be removed to a minimum 8-inch clearance around the bottom and sides of all the pipe being laid. Select Fill shall be used as backfill upon removal of any rock subject to the approval of the Engineer.
- C. The trench may be excavated by machinery to, or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
- D. Where pipe is to be installed in fill, fill shall be placed and compacted to the total depth required (rough grade elevation) and then re-excavated for pipe installation.

3.03 EXCAVATION BELOW DESIGN GRADE

- A. Excavation below the design grade limits shown on the Drawings performed without the approval of the Engineer shall be refilled at the Contractor's expense with 8-inch layers of compacted Select Fill or other material satisfactory to the Engineer.

- B. If, in the opinion of the Engineer, the subgrade material, in its undisturbed natural condition after excavation, at or below the design grade of the excavation as indicated on the Drawings is unsuitable for foundations (i.e., waste materials, organic soils, highly micaceous silt and other unsuitable materials or rock within 4 feet of the subgrade) it shall be removed to such dimensions as directed by the Engineer and be replaced with suitable material for which compensation will be made to the Contractor at the unit price established in Section 00300.
- C. If the Contractor does not care for the subgrade properly through: failure to postpone final excavation immediately above the subgrade until shortly before placing of the new work thereon, failure to provide adequate dewatering or surface drainage, or other failure or neglect to conduct the excavation work properly so that the surface of the subgrade is in proper condition for further construction; the Contractor shall remove the unsuitable material and replace it with concrete, compacted select fill, or other approved material at the Contractor's expense so that the condition of the subgrade meets the approval of the Engineer before any work is placed thereon.

3.04 ROCK AND BOULDER EXCAVATION (if applicable)

- A. The following material classifications, based on the type of excavation equipment required, shall be used to identify materials for payment:
 - 1. Soil or Partially Weathered Rock - Soil or partially weathered rock (PWR) shall be defined as any material that can be removed by a hydraulic excavator having a maximum draw bar force of not less than 59,000 pounds (Komatsu PC300LC or equivalent) based on the manufacturer's specifications for standard configuration.
 - 2. Rippable rock - Rippable rock shall be defined as any material that cannot be removed by a hydraulic excavator having a maximum draw bar force of not less than 59,000 pounds (Komatsu PC300LC or equivalent) but can be removed by a Caterpillar D-8N or equivalent equipped with a single tooth ripper.
 - 3. Rock - Rock shall be defined as any material that cannot be removed by a Caterpillar D-8N or equivalent equipped with a single shank ripper. Rock materials that are located within the lines of required excavation shall be excavated using hydraulic breakers, jack hammers or other similar approved method.

BLASTING WILL NOT BE ALLOWED.

- B. Where rock is encountered, it shall be uncovered but not excavated until measurements have been made in accordance with Specification Section 01025 – Measurement and Payment. The means of excavation shall be subject to approval by the Engineer. There will not be additional payment for excavation of partially weathered rock.
- C. If rock is encountered in the C&D Landfill, Phase 7 or Subtitle D Landfill, Cell 7, Contractor shall immediately notify the Engineer. The Owner may elect to require specific rock removal hours and/or days depending on location of rock as to not interfere with operations.

- D. Excavation below the Compacted Soil Liner will be based on the grades shown on the Drawings and the Engineer. The minimum depth of rock excavation below the bottom of the Compacted Soil Liner shall be four feet.
- E. Trench excavation for pipes will be based on the rectangular cross-sections as follows:
 - 1. Width: Minimum 8 inches from the sides of the pipe and larger as necessary for proper placement and compaction of pipe bedding and backfill.
 - 2. Depth: 8 inches below the bottom of the pipe or deeper where directed by the Engineer.
 - 3. Height: Based on the actual elevation of top of rock surface, as determined by the Engineer.
 - 4. Boulders of more than 1 cubic yard in volume will be measured for payment as rock excavation.

3.05 MISCELLANEOUS EXCAVATION

- A. The Contractor shall perform all excavations necessary for constructing roadways, ponds, and any other miscellaneous earth excavation required under this Contract.

3.06 GENERAL BACKFILL

- A. Materials placed in fill areas shall be placed to the lines and grades shown on the Drawings. Unless otherwise specified, Common Fill shall be used for backfill.
- B. Fill shall be placed in accordance with the Contract Documents.
- C. Material conforming to the requirements of Common Fill, Select Fill and Structural Fill shall be placed in layers having a maximum thickness of 8-inches measured before compaction and shall be compacted as specified in Paragraph 2.01. The minimum frequency of testing shall be 1 test per lift per 10,000 square feet or as directed by the Engineer in irregular-shaped fill areas.
- D. The surfaces of filled areas shall be graded to smooth true lines, conforming to grades indicated on the grading plan and no soft spots or uncompacted areas will be allowed in the work.
- E. No compacting shall be done when the material is covered with frost or is frozen or is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have thawed and/or dried sufficiently to permit proper compaction.
- F. All backfill shall be placed at a moisture content within 3% of Standard Proctor (ASTM D698) optimum moisture content, unless otherwise stated.

3.07 TRENCH BACKFILL

- A. Backfilling over pipes shall begin as soon as practicable after the pipe has been laid, jointed, and inspected. All backfilling shall be performed expeditiously.

1. Screened gravel shall be placed around the lower half of the pipe and compacted by machine tamping to obtain uniform subgrade for pipe installation as shown on the drawings.
2. Select Fill shall be thoroughly compacted by machine tamping in 12-inch layers as required to provide 95% of the maximum dry density as determined by ASTM D698.
3. The remainder of the trench shall be backfilled with common fill placed in loose layers not to exceed 8-inches and thoroughly compacted with mechanical tampers as required to obtain 95% of the maximum dry density as determined by ASTM D698.
4. Backfilling under haunches shall be performed manually by tamping rods or similar hand equipment to eliminate voids underneath sides of the pipe or haunch.
5. Field density testing shall be conducted at a minimum testing frequency of one test per lift per 50 linear feet of trench for all material types.

3.08 ROAD SUBGRADE

- A. The road subgrade for crushed stone and asphalt pavement areas in fill section shall consist of two-foot thick layer of Select Fill. The Select Fill shall be placed and compacted in accordance with the Paragraph 3.06.
- B. The road subgrade for crushed stone and asphalt pavement areas in cut sections shall consist of firm natural soils as approved by the Engineer.
- C. Road subgrades shall be proofrolled as described in Paragraph 3.01 G.

3.09 C&D LANDFILL, PHASE 7 EXCAVATION AND BACKFILL

- A. The subgrade surface shall not be smooth rolled. The subgrade surface shall be left in a roughened condition to allow vegetative growth.
- B. The Engineer shall be notified if bedrock or other unpredicted subsurface conditions are encountered during excavation.

3.10 HANDLING OF SURPLUS MATERIAL

- A. Excavated materials shall not be removed from the site except as specified by the Engineer. Materials shall be neatly stockpiled on-site at locations directed by the Owner.
- B. Surplus fill shall become the property of the Owner and be stockpiled at locations directed by the Owner.

3.11 DISPOSAL AND REPLACING OF ROCK

- A. The Contractor shall remove and dispose of all pieces of ledge and boulders which are not suitable for use in other parts of the work. Rock disposed by hauling away to spoil areas is to be replaced by approved surplus soil excavation obtained elsewhere on the work, insofar as it is

available. Any deficiency in the backfill material shall be made up with acceptable onsite material approved by the Engineer. The cost of replacement of rock with soil shall be included within the rock excavation pay item.

- B. Rock and boulders larger than 6-inches in diameter may not be used in Common Fill.

3.12 GRADING

- A. Grading in preparation for placing of Compacted Soil Liner shall be performed to the elevations shown and otherwise as directed by the Engineer and shall be performed in such a manner that the requirements for formation of embankments can be followed. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. When required, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the performance or condition of work.
- B. If at the time of grading it is not possible to place material in its final location, it shall be stockpiled in approved areas. Stockpiled material shall be placed, compacted and smooth rolled at the end of each day to deter water infiltration. No extra payment will be made for the stockpiling or double handling of excavated material.
- C. Engineer reserves the right to make minor adjustments in lines or grades if deemed necessary as the work progresses, in order to obtain satisfactory construction.
- D. Stone or rock fragments larger than four (4) inches in their greatest diameter will not be permitted in the top six (6) inches of the finished subgrade of all fills or embankments.
- E. In cuts, all loose or protruding rocks on the back slopes shall be barred loose or otherwise removed to finished grade of slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as directed by the Engineer.
- F. In cuts where highly, micaceous, elastic silts or cohesionless silts are encountered at subgrade, the material shall be undercut to a depth of at least 18 inches below the subgrade and replaced with Select Fill as directed by the Engineer. Payment for this item will be as bid in Section 00300.
- G. Final grading of earthwork shall be uniform in slope and shall result in a finished surface with a tolerance of 0.3 feet above or 0.1 feet below the elevations indicated on the Drawings except for the subgrade of the landfill base grades which shall be uniform in slope and shall result in a finished subgrade surface with a tolerance of 0.1 feet above or below the elevations indicated on the Drawings.

END OF SECTION 02200

SECTION 02271

FABRIC CUSHION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install fabric cushion complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02623: High Density Polyethylene (HDPE) Pipe
- B. Section 02776: High Density Polyethylene (HDPE) Geomembrane

1.03 SUBMITTALS

- A. Within 15 calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
 - 1. Manufacturer's background information.
 - 2. Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - 3. List of typical material property values corresponding to the requirements of the specification and samples of the fabric cushion with attached certified test results.
 - 4. Manufacturer's quality control program and manual including description of laboratory facilities.
 - 5. A list of three projects where heavy weight geotextile fabric cushion was used, including:
 - a. Name and purpose of project, location and date of installation.
 - b. Name of owner, design engineer and installer.
 - c. Fabric mass per unit area and surface area.
 - d. Information on performance of the fabric cushion.

6. Shop Drawing, including details of overlap, seaming, anchoring, connections and other construction details.
7. Installation schedule.
8. A manual that specifically defines the quality control and quality assurance program during installation.
9. Copy of quality control certificates in conformance with Paragraph 2.03.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
2. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
3. ASTM D4759 - Standard Practice for Determining the Specifications Conformance of Geosynthetics
4. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
5. ASTM D4873 - Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples
6. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics
7. ASTM D5261 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles
8. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 FABRIC APPLICATIONS

- A. The fabric cushion is to be used for puncture protection of the HDPE geomembrane. By placement of the fabric cushion between the stone and the HDPE geomembrane, the

fabric cushion is to prevent the stone drainage layer from damaging the HDPE geomembrane.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Geotextile labeling, shipment and storage shall follow ASTM D4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap of geotextile material must be discarded before installation.
- F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperature in excess of 71°C (160°F) and any other environmental condition that might damage the geotextile.

1.07 MATERIAL WARRANTY

- A. The manufacturer shall warrant that the fabric cushion shall be of merchantable quantity (as defined by the Uniform Commercial Code). The manufacturer shall guarantee that the fabric cushion furnished is suitable for the purpose intended and free from defects of material and workmanship. In the event the fabric cushion fails to perform as specified, the fabric cushion manufacturer shall promptly replace defective fabric cushion without any cost to the Owner.

1.08 GUARANTEE

- A. The Contractor shall guarantee the fabric cushion against defects in installation and workmanship for the period of two (2) years commencing with the date of Substantial Completion. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

PART 2: PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

2.02 MATERIALS

- A. Nonwoven Fabric
1. The fabric cushion shall be a nonwoven, needle punched fabric consisting of polypropylene or polyester fibers or filament formed into a stable network, such as Mirafi, Huesker, TNS Mills, or equal. The fabric cushion shall not be heat bonded.
 2. The fabric cushion shall be inspected by the manufacturer for broken needles by permanently installed on-line metal detectors at the production facility.
 3. The fabric cushion shall be nonbiodegradable, nonreactive within a pH range of three to eleven, resistant to ultraviolet light exposure, and resistant to insects and rodents. The fabric cushion shall have achieved a minimum value of 97 percent for the EPA 9090 chemical resistance test. Test results from any sampled roll in the lot, when tested in accordance with ASTM D4759, shall meet or exceed the values listed in Table 1. All strength values are for the weaker principal direction.

TABLE 1
MINIMUM AVERAGE ROLL VALUES
FOR
FABRIC CUSHIONS

PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUES
Mass per Unit Area	ASTM D5261	oz./yd ²	28
Thickness	ASTM D5199	mils	265±10%
Grab Tensile Strength (MDCD)	ASTM D4632	lbs	500/400
Grab Elongation	ASTM D4632	%	50
CBR Puncture Test	ASTM D6241	lbs	2000
Trapezoidal Tear	ASTM D4533	lbs	120

2.03 QUALITY CONTROL DOCUMENTATION

A. Prior to installation, the Contractor shall provide to the Owner the following information certified by the manufacturer for the delivered fabric.

1. Each roll delivered to the Project site shall have the following identification information:

- Manufacturer's name
- Product identification
- Gross roll weight
- Roll number
- Roll dimensions

2. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have a roll identification number, testing procedures, frequency and test results. At a minimum, the following test results shall be provided every 50,000 square feet of manufactured fabric in accordance with the test requirements specified in Paragraph 2.02.

- Thickness
- Mass per Unit Area
- CBR Puncture
- Grab Tensile
- Trapezoid Tear

2.04 CONFORMANCE TESTING

A. Conformance testing shall be performed by an independent Quality Assurance Laboratory (QAL) procured by the Contractor. Engineer shall obtain samples from the delivered material, mark the machine direction and identification number. One sample shall be taken per 100,000 square feet, or one sample per lot, whichever results in the greater number of conformance tests. A Lot number will be defined as a continuous production process without changes to raw material or manufacturing methods. This sampling frequency may be increased as deemed necessary by the Engineer. For every change in Lot number, the Contractor shall perform conformance testing on the initial roll at the Contractor's expense. The samples shall be taken across the entire roll width and shall not include the first 3-ft. The following conformance tests shall be conducted at the laboratory.

- | | | |
|----|--------------------|--------------|
| 1. | Mass per unit area | (ASTM D5261) |
| 2. | CBR puncture | (ASTM D6241) |
| 3. | Grab tensile | (ASTM D4632) |

- 4. Thickness (ASTM D5199)
- 5. Trapezoidal Tear (ASTM D4533)
- B. These conformance tests shall be performed in accordance with test requirements Paragraph 2.02.
- C. All conformance test results shall be reviewed by the Engineer and accepted, prior to the deployment of the fabric. All test results shall meet, or exceed, the property values listed in Paragraph 2.02.
- D. Test specimens shall be obtained from each conformance sample in accordance with the respective ASTM standard. Average values shall be calculated from the test specimen results and compared to the minimum average roll values listed in Table 1. If any average value of a conformance sample is less than the minimum average value specified in Table 1, the sample shall be determined to be a failing sample. If a conformance sample fails, all rolls within the sampled 100,000 square feet or lot will be rejected for use on the project unless the Engineer approves additional testing.
- E. The manufacturer reserves the right to obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer and request testing by the QCL at the manufacturer's expense. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.
- F. If the fabric fails the initial material conformance tests, the Contractor shall pay for the cost of subsequent conformance testing until all conformance tests are passed and the fabric is accepted by the Engineer.

PART 3: EXECUTION

3.01 REQUIREMENTS PRIOR TO INSTALLATION

- A. Preparation of the surface shall be in accordance with Section 02776.
- B. The geomembrane shall be cleaned of stones, soil, liner scrap, and all other materials, and a final inspection of the geomembrane shall be performed by the Engineer.
- C. The fabric cushion shall be inspected by the Engineer for imperfections and damage. All defective rolls shall be removed from the site at the expense of the contractor.

3.02 INSTALLATION

- A. Fabric Cushion Placement

1. The fabric cushion shall be installed as shown on the Drawings and as specified herein.
2. The fabric cushion shall only be cut using a hook blade knife, scissors with rounded tips or as otherwise approved by the Engineer.
3. The Contractor shall exercise extreme care during installation to prevent damage to the HDPE geomembrane. The Contractor shall prevent stones, soil, liner scrap, and all other material from being entrapped between the geomembrane and the fabric cushion. Only smooth soled shoes approved by the Engineer shall be worn by the installers. The Contractor shall not use the installed fabric cushion as a storage area for tools and supplies.
4. The Engineer shall have the authority to order the immediate stoppage of work as a result of improper installation procedures or any reason that may cause defective installation.
5. Damage to the fabric cushion occurring during placement shall be repaired immediately at no additional expense to the Owner.

B. Seaming Method

1. Adjoining fabric cushion panels shall be overlapped a minimum of 4 inches and heat seamed using a hot-wedge welder. The heat seam shall be continuous along the length of the overlap. The area to be welded shall be clean and dry. The hot-wedge welding equipment shall be capable of continuously controlling and monitoring the temperature of the hot wedge platen.
2. All seams constructed on sloped surfaces that are 4 to 1 or greater shall be vertical seams. All vertical panels placed on 4 to 1 slopes or greater shall extend 5 feet beyond the toe of slope.

C. Cover

1. All fabric cushion shall be covered within fourteen days. If delay of rock layer installation exceeds 14 days a protective cover such as a woven geotextile with high UV resistance shall be temporarily placed over the fabric cushion until rock placement occurs.

D. Repairs

1. Fabric repairs shall be made with patches of the same material, using an approved seaming system. The patch size shall be twenty-four inches larger in all directions than the area to be repaired. The corners of the patch shall be rounded.

3.03 FIELD QUALITY CONTROL

- A. Two duplicate documentation files for fabric cushion placement shall be maintained. One shall be maintained by the Contractor and the other by the Engineer. At the end of each work week the files shall be updated and checked to assure that all copies of pertinent project information are included in each file. The Contractor shall submit daily copies of the documentation to the Engineer.
- B. Prior to placement of the rock drainage layer, the fabric cushion installation and related work shall be inspected by the Engineer. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements of cleanliness and workmanship, as determined by the Engineer.
- C. Probe testing shall be conducted on all seams by the Engineer's Representative. A dull pointed probe is run along the edge of a seam to detect defects. All defects shall be marked for repair. Defective seams shall be repaired by hot wedge welding. If the location of the defective seam prevents hot wedge welding, an air leister gun shall be used.
- D. Discrepancies shall be noted and repaired at no additional expense. Final acceptance of the system shall be contingent upon the approval of the Engineer.
- E. The Contractor shall furnish record drawings showing changes, if any, from the approved installation drawings which are to include any patches used to repair cushion defects, and all panel and patch identifications assigned in the fields. The Contractor shall also provide complete documentation for final installation of the fabric cushion.

END OF SECTION 02271

SECTION 02272

FILTER FABRIC

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install filter fabric complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

Related work includes, but is not limited to, the following:

- A. Section 02200: Excavation, Backfill and Compaction
- B. Section 02276: Erosion and Sedimentation Control
- C. Section 02623: High Density Polyethylene (HDPE) Pipe
- D. Section 02700: Protective Cover Aggregate

1.03 SUBMITTALS

- A. Within 15 calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
 - 1. Manufacturer's background information.
 - 2. Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - 3. List of material properties and samples of filter fabric with attached certified test results.
 - 4. Manufacturer's quality control program and manual including description of laboratory facilities.
 - 5. A list of ten completed facilities where the filter fabric is used including:
 - a. Name and purpose of facility, its location and date of installation.
 - b. Name of owner, project manager, design engineer and installer.
 - c. Fabric thickness and surface area.

- d. Information on performance of the facility.
- 6. Shop Drawing, including details of overlap, seaming, anchoring, connections and other construction details.
- 7. Installation schedule.
- 8. A manual that specifically defines the quality control and quality assurance program during installation including manufacturer's installation instructions.
- 9. Copy of quality control certificates in conformance with Paragraph 2.03.

1.04 REFERENCE STANDARDS

Reference standards include, but are not limited to, the following:

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
 - 2. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
 - 3. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - 4. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile
 - 5. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics
 - 6. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
 - 7. ASTM D4873 - Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples
 - 8. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics
 - 9. ASTM D5261 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 FABRIC APPLICATIONS

- A. The filter fabric is to be used for filtration for the RCP stone bedding, placement beneath riprap, and other erosion control uses. The property values for the filter fabric are specified herein.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Geotextile labeling, shipment and storage shall follow ASTM D4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.
- D. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage. If the wrapping is damaged prior to installation, the outer wrap of geotextile material must be discarded before installation.
- F. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperature in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the geotextile.

1.07 REQUIREMENTS PRIOR TO INSTALLATION

- A. Subgrade shall be inspected and approved by the Engineer prior to installation of the filter fabric. The subgrade shall be smooth, uniform and compacted for the installation of the fabric.

1.08 MATERIAL WARRANTY

- A. The manufacturer shall warrant that the filter fabric shall be of merchantable quantity (as defined by the Uniform Commercial Code). The manufacturer shall guarantee that the filter fabric furnished is suitable for the purpose intended and free from defects of material and workmanship. In the event the filter fabric fails to perform as specified, the filter fabric manufacturer shall promptly replace defective filter fabric without any cost to the Owner.

1.09 GUARANTEE

- A. The Contractor shall guarantee the filter fabric against defects in installation and workmanship for the period of two (2) years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

2.02 MATERIALS

A. Nonwoven Fabric

1. All fabric shall be a nonwoven needle punched polypropylene fabric consisting of filaments formed into a stable network, such as Mirafi, Solmax or equal.
2. The filter fabric shall be inspected by the manufacturer for broken needles by permanently installed on-line metal detectors at the production facility.
3. The fabric shall be nonbiodegradable, nonreactive within a pH range of three to eleven, resistant to ultraviolet light exposure, and resistant to insects and rodents. Test results from any sampled roll in the lot, when tested in accordance with ASTM D4759, shall meet or exceed the values listed in Table 1. All strength values are for the weaker principal direction.

TABLE 1
MINIMUM AVERAGE ROLL VALUES
FOR GEOTEXTILE FABRICS

PROPERTIES	TEST METHOD	MINIMUM AVERAGE ROLL VALUES	
		UNIT	8 OZ.
Mass Per Unit Area	ASTM D5261	oz/yd ²	8.0
Thickness	ASTM D5199	mils	90
Grab Strength	ASTM D4632	lbs	205
Grab Elongation	ASTM D4632	%	50
CBR Puncture Strength	ASTM D6241	lbs	550
Permittivity	ASTM D4491	sec ⁻¹	1.05
Apparent Opening Size	ASTM D4751	mm	0.180
Trapezoidal Tear	ASTM D4533	lbs	95

2.03 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation, the Contractor shall provide to the Owner the following information certified by the manufacturer for the delivered fabric.
1. Each roll delivered to the Project site shall have the following identification information:
 - a. Manufacturer's name
 - b. Product identification
 - c. Thickness
 - d. Roll number
 - e. Roll dimensions
 2. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll identification number, sampling procedures, frequency and test results. At a minimum the following test results shall be provided every 50,000 square feet of manufactured fabric in accordance with test requirements specified in Paragraph 2.02.
 - a. Thickness
 - b. Trapezoid Tear
 - c. CBR Puncture Strength
 - e. Grab Tensile

2.04 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent Quality Assurance Laboratory (QAL) procured by the Contractor. Engineer shall obtain samples from the delivered material, mark the machine direction and identification number. One sample shall be taken per 100,000 square feet, or one sample per lot, whichever results in the greater number of conformance tests. A Lot number will be defined as a continuous production process without changes to raw material or manufacturing methods. This sampling frequency may be increased as deemed necessary by the Engineer. For every change in Lot number, the Contractor shall perform conformance testing on the initial roll. The samples shall be taken across the entire roll width and shall not include the first 3-ft. The following conformance tests shall be conducted at the laboratory:
1. Mass per unit area (ASTM D5261)
 2. CBR puncture (ASTM D6241)
 3. Grab tensile (ASTM D4632)

- 4. Permittivity (ASTM D4491)
- 5. Apparent opening size (ASTM D4751)
- B. These conformance tests shall be performed in accordance with test requirements Paragraph 2.02.
- C. All conformance test results shall be reviewed by the Engineer and accepted, prior to the deployment of the fabric. All test results shall meet, or exceed, the property values listed in Paragraph 2.02.
- D. Test specimens shall be obtained from each conformance sample in accordance with the respective ASTM standard. Average values shall be calculated from the test specimen results and compared to the minimum average roll values listed in Table 1. If any average value of a conformance sample is less than the minimum average value specified in Table 1, the sample shall be determined to be a failing sample. If a conformance sample fails, all rolls within the sampled 100,000 square feet or lot will be rejected for use on the project unless the Engineer approves additional testing.
- E. The manufacturer reserves the right to obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer and request testing by the QCL at the manufacturer's expense. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.
- F. If the fabric fails the first-run unit conformance tests, the Contractor shall pay for the cost of subsequent conformance testing until all conformance tests are passed and the fabric is accepted by the Engineer.

PART 3 EXECUTION

3.01 REQUIREMENTS PRIOR TO INSTALLATION

- A. Subgrade shall be inspected and approved by the Engineer in accordance with Section 02200 prior to installation of the filter fabric. The subgrade shall be smooth, uniform and compacted for the installation of the fabric.

3.02 INSTALLATION

- A. Fabric Placement
 - 1. The filter fabric shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations and approved shop drawings.
 - 2. The subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the filter fabric beneath the erosion control stone.

3. Damage to the filter fabric occurring during placement shall be repaired immediately at no additional expense to the Owner.
4. All fabric installation for beneath erosion control stone shall be completely covered at the end of each work day unless otherwise approved by the Engineer.

B. Field Overlap

1. The fabric used for bedding shall be overlapped a minimum of 12-inches respectively.

END OF SECTION 02272

SECTION 02273

WOVEN MONOFILAMENT FABRIC

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install woven monofilament geotextile complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02271: Fabric Cushion
- B. Section 02623: High Density Polyethylene (HDPE) Pipe
- C. Section 02776: High Density Polyethylene (HDPE) Geomembrane

1.03 SUBMITTALS

- A. Within 15 calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
 - 1. Manufacturer's background information.
 - 2. Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - 3. List of material properties and samples of geotextile with attached certified test results.
 - 4. Manufacturer's quality control program and manual including description of laboratory facilities.
 - 5. A list of ten completed facilities where the geotextile is used including:
 - a. Name and purpose of facility, its location and date of installation.
 - b. Name of owner, project manager, design engineer and installer.
 - c. Geotextile thickness and percent open area.
 - d. Information on performance of the facility.
 - 6. Shop Drawing, including:
 - a. Details of overlap and seaming of the geotextile, anchoring, connections and other construction details as well as any variance or additional details which deviate from the drawings.

7. Installation schedule.
8. A manual that specifically defines the quality control and quality assurance program during installation including manufacturer's installation instructions.
9. Copy of quality control certificates in conformance with Paragraph 2.03.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
2. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
3. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
4. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile
5. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics
6. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
7. ASTM D4873 - Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples
8. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics
9. ASTM D5261 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The quality control and quality assurance consist of conformance testing of material delivered to the site and field quality control during installation.
- B. Conformance testing requirements are specified in Paragraph 2.04. The purpose of conformance testing is to assure that the supplied material conforms to the Specifications and to the manufacturer's quality control certificates.

- C. Field quality control requirements are specified in Paragraph 3.03. The purpose of field quality control procedures is to assure that the geotextile material has been installed in accordance with the Specifications and manufacturer's recommendations.

1.06 SYSTEM DESCRIPTION

- A. The geotextile is intended to act as a filter between the protective rock layer and the rock surrounding the leachate collection pipe.

1.07 DELIVERY, STORAGE AND HANDLING

- A. The geotextile shall be shipped, stored and handled in accordance with manufacturer's recommendations and as specified herein.
- B. No mechanical equipment shall be driven directly on top of the geotextile.
- C. The geotextile shall be stored in such a way that is protected from prolonged exposure to ultraviolet radiation and shall be elevated from the ground (a minimum of 3-in) to protect the geotextile from standing water.

1.08 MATERIAL WARRANTY

- A. The manufacturer shall warrant that the fabric shall be of merchantable quantity (as defined by the Uniform Commercial Code). The manufacturer shall guarantee that the fabric furnished is suitable for the purpose intended and free from defects of material and workmanship. In the event the fabric fails to perform as specified, the fabric manufacturer shall promptly replace defective fabric without any cost to the Owner.

1.09 GUARANTEE

- A. The Contractor shall guarantee the woven monofilament geotextile against defects in installation and workmanship for the period of two (2) years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

PART 2: PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

2.02 MATERIALS

A. Woven Geotextile

- 1. The geotextile shall be a monofilament woven material consisting of propylene formed into a stable network such that the filaments retain their relative position to each other. Material shall be nonbiodegradable, nonreactive within a pH range of three to eleven,

resistant to ultraviolet light exposure and shall meet the following minimum average roll values:

PROPERTIES	TEST METHOD	MINIMUM AVERAGE ROLL VALUES	
		UNIT	6 OZ.
Mass Per Unit Area	ASTM D5261	oz/yd ²	6.0
Thickness	ASTM D5199	mils	15
Grab Strength	ASTM D4632	lbs	260
Grab Elongation	ASTM D4632	%	15
CBR Puncture Strength	ASTM D6241	lbs	900
Permittivity	ASTM D4491	sec ⁻¹	1.1
Apparent Opening Size	ASTM D4751	mm	0.4
Flow Rate	ASTM D4491	gpm/ft ²	60

2. The values listed above are for the weaker principal direction.

2.03 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any woven monofilament geotextile material, the Contractor shall provide to the Owner the following information certified by the manufacturer for the delivered woven monofilament geotextile material.
- Each roll delivered to the Project site shall have the following identification information:
 - Manufacturer's name
 - Product identification
 - Thickness
 - Roll number
 - Roll dimensions
 - Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll identification number, sampling procedures, frequency and test results. At a minimum the following test results shall be provided every 200,000 square feet of manufactured geotextile in accordance with test requirements specified in Paragraph 2.02.
 - Thickness

- b. Mass per unit area
- c. CBR puncture strength
- d. Grab tensile
- e. Permeability
- f. Apparent opening size

2.04 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent Quality Assurance Laboratory (QAL) procured by the Contractor. Engineer shall obtain samples from the delivered material, mark the machine direction and identification number. One sample shall be taken per 100,000 square feet, or one sample per lot, whichever results in the greater number of conformance tests. A Lot number will be defined as a continuous production process without changes to raw material or manufacturing methods. This sampling frequency may be increased as deemed necessary by the Engineer. For every change in Lot number, the Contractor shall perform conformance testing on the initial roll. The samples shall be taken across the entire roll width and shall not include the first 3-ft. The following conformance tests shall be conducted at the laboratory:
 - 1. Mass per unit area (ASTM D5261)
 - 2. CBR puncture strength (ASTM D6241)
 - 3. Grab tensile (ASTM D4632)
 - 4. Permittivity (ASTM D4491)
 - 5. Apparent opening size (ASTM D4751)
- B. These conformance tests shall be performed in accordance with test requirements specified in Paragraph 2.02 and conducted in accordance with ASTM D4759.
- C. All conformance test results shall be reviewed by the Engineer and accepted or rejected, prior to the deployment of the geotextile. All test results shall meet, or exceed, the property values listed in Paragraph 2.02 above. The course of action to be implemented for failing tests shall be approved by the Engineer.
- D. The manufacturer may obtain additional samples from rolls immediately before and after the failing roll or as directed by the Engineer and have them tested by the QAL. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

PART 3: EXECUTION

3.01 PREPARATION

- A. All work shall be done in a manner so as not to damage or degrade any existing landfill liner system, leachate collection or gas collection system.

- B. General

- 1. Following excavation, backfill, and compaction and prior to placement of the geotextile, preparation of the subgrade shall be in accordance with Sections 02200 and 02271.
 - 2. The geomembrane and nonwoven geotextile cushion shall be inspected by the CQA Staff prior to installation of the woven geotextile.

3.02 INSTALLATION

- A. Panel Placement

- 1. The geotextile shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations and approved shop drawings. The number of rolls and installed surface area should be documented.
 - 2. No mechanical equipment shall be driven directly on top of the geotextile.
 - 3. The geomembrane shall be protected during installation of the geotextile.
 - 4. HDPE pipe shall be installed in accordance with Section 02623.
 - 5. No mechanical equipment shall be allowed directly on top of the geotextile material. Equipment shall be driven on pre-deposited material.
 - 6. Damage to the geotextile occurring during the placement of soil cover shall be repaired immediately at no additional expense to the Owner.
 - 7. All geotextile installation shall be completely covered at the end of each work day unless otherwise approved by the Engineer.
 - 8. The geotextile shall be properly weighted to avoid uplift due to wind.

- B. Field Seaming

- 1. The geotextile panels shall be sewn together. The thread used to sew the panels shall be suitable for intended use in leachate systems and as approved by the manufacturer. Sewn geotextile panels shall be overlapped by a minimum of 6-in.

3.03 FIELD QUALITY CONTROL

- A. Prior to completion of the leachate collection system, the geotextile installation and related work shall be inspected by the Engineer. All work in the system therein being inspected shall be complete, clean and ready for use. All work shall meet the requirements as to line, grade, cleanliness and workmanship, as determined by the Engineer.

- B. All discrepancies shall be noted and repaired at no additional expense. Final acceptance of the system shall be contingent upon the approval of the Engineer.

3.04 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

END OF SECTION 02273

SECTION 02276

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work shown on the Drawings and specified herein shall constitute the erosion control plan for this Project in conformance with the North Carolina Sedimentation Pollution Control Act and shall include repairing and maintaining existing erosion and sedimentation controls, constructing and maintaining proposed erosion and sedimentation controls and removing temporary erosion and sedimentation controls as necessary during construction. The erosion control plans and details are based on the anticipated construction methods and sequences, and include the principal measures required by NCDEQ Erosion and Sediment Control Program. Other erosion control measures may be required to prevent sediment and erosion resulting from the actual means, methods and techniques employed during construction. Provide and pay for all required erosion and sedimentation control measures and comply with the erosion and sedimentation control plan approved by NCDEQ for this Project.
- B. Temporary erosion controls may include, but are not limited to surface stabilization which shall be accomplished with vegetation and mulch, erosion matting, temporary earthen diversion berms, silt fencing, sediment traps, rock dams, riprap apron protection, and minimization of disturbed acreage. The performance of Contractor's erosion controls is subject to approval by Owner and NCDEQ Erosion and Sediment Control Program.
- C. Stockpiles shall be protected from transfer of material due to erosion by providing silt fencing along the toe of the slopes, using slope downdrains for long, steep slopes, and by maintaining stable slopes.
- D. The Contractor is responsible for submitting and obtaining an amendment to the existing approved erosion and sedimentation control plan to cover any deviations from the approved plan.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement. Any violations of laws and fines imposed shall be the sole responsibility of the Contractor including payment of fines.

1.03 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectional acts and corrective action to be taken. Failure of the Engineer to provide such notice shall not relieve the Contractor of his responsibility to comply with all applicable specification provisions, regulations and laws. State or local agencies responsible for verification of certain aspects of the environmental protection requirements may notify the Contractor in writing of any non-compliance with State or local requirements. The

Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 REFERENCE DOCUMENTS

- A. Standard Building Code
- B. North Carolina Sediment and Erosion Control Manual
- C. NCDEQ Approved Erosion Control Plan

1.05 RELATED WORK

- A. Section 02100: Site Preparation
- B. Section 02200: Excavation, Backfill, and Compaction
- C. Section 02985: Seeding and Mulching

1.06 SUBMITTALS

- A. Submit to Engineer the following information in accordance with Section 01300:
 - 1. Product data for all erosion and sedimentation control materials.
 - 2. Manufacturer's installation recommendations for erosion control matting.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of the manufacturer's name and product number is for the purpose of establishing the standard of quality and general characteristics desired.

2.02 CONTROL STRUCTURES

- A. Provide erosion and sedimentation controls as shown on the drawings and as specified herein. Controls may include, but not be limited to: seeding and mulching, erosion control matting, riprap, erosion control stone, filter fabric, silt fence, fabric drop inlet protection, earthen diversion berms, sediment ponds, sediment traps, rock dams, level spreaders, permanent stream crossings, sediment ponds, and other similar controls.

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, stumps, roots larger than ½-inch in diameter and debris.
2. Sow seed within twenty-four (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 ¾-inch and 1-1/2-inches.
4. Apply netting over mulched areas on sloped surfaces greater than 4 to 1.
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. Prior to clearing and/or grubbing and removal of vegetation and topsoil, Contractor shall initially repair and clean existing sediment ponds as presented in the drawings and install new erosion and sedimentation control measures as specified and necessary to provide proper sedimentation and erosion control in compliance with NCDEQ Erosion and Sediment Control Program, including, but not limited to silt fencing, sediment traps, rock dams, fabric drop inlet protection, diversion berms, ditches, riprap apron protection, sediment ponds, and other appurtenances required by NCDEQ Erosion and Sediment Control Program.
- B. Contractor shall clear and/or grub only enough area to install erosion and sedimentation control measures. Silt fence shall be installed as needed to insure against off-site runoff until all diversion structures are constructed and operational. Contractor is responsible for preventing migration of sediment into wetland areas, rivers, streams and adjacent properties during construction. All disturbed areas shall drain toward installed erosion and sedimentation control measures. Owner may stop all work on the project if a Notice of Violation is issued by the NCDEQ Erosion and Sediment Control Program relating to Contractor's work, and such stoppage shall remain in effect until such violations are corrected to the satisfaction of the Erosion and Sediment Control Program.
- C. The Contractor is responsible for submitting and obtaining an amendment to the existing approved erosion and sedimentation control plan to cover any planned land disturbance activities within the "potential soil liner and fill borrow source" areas.
- D. Contractor shall maintain all temporary and permanent erosion control structures within the construction limits. Contractor shall provide routine removal of sediment and maintenance of all existing sedimentation control devices located within the construction limits during the entire contract period in compliance with the NCDEQ Erosion and Sediment Control Program. Maintenance shall include, but not be limited to, making all repairs necessary to maintain the

structures as well as remove all accumulated sediment as necessary to maintain the structures in proper working condition. The frequency of sediment removal from all on-site erosion control structures shall be bi-monthly at a minimum.

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 State of North Carolina, Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.
- B. Ditches, channels, ponds and other disturbed areas are to be seeded as required as soon as possible.
- C. Erosion evident within the limits of construction shall be the responsibility of the Contractor during the full Contract term and for the one (1) full year guarantee period. Areas subject to erosion during this time shall be fully restored to original or design conditions (as applicable) within ten (10) days of notice to the Contractor.

END OF SECTION 02276

SECTION 02277

GEOSYNTHETIC CLAY LINER (GCL)

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install Geosynthetic Clay Liner (GCL) as shown on the Drawings and as specified herein. The work shall include unloading, storing placement, seaming, and anchoring of the GCL, field quality control and all other work as shown on the Drawings and as specified herein.
- B. Sufficient material and accessory bentonite shall be furnished to cover all areas as shown on the Drawings, including overlaps at field seams.

1.02 RELATED WORK

- A. Section 02200: Excavation, Backfill, and Compaction
- B. Section 02278: Compacted Soil Liner
- C. Section 02776: High Density Polyethylene (HDPE) Geomembrane

1.03 SUBMITTALS

- A. Within 30 calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
 - 1. Submittals relating to GCL manufacturer and GCL:
 - a. Corporate background
 - b. Manufacturing capabilities:
 - 1) Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - 2) List of material properties and samples of GCL with attached certified test results.
 - 3) Manufacturer's quality control program and manual including description of laboratory facilities.
 - 4) A list of ten similarly completed facilities totaling a minimum of three million square feet, for which the manufacturer has manufactured a GCL. The following information shall be provided for each facility.

- a. Name and purpose of facility, its location and date of installation.
 - b. Name of owner, project manager, design engineer and installer.
 - c. GCL surface area.
 - d. Information on performance of the facility.
 - c. The origin of the bentonite and geotextiles to be used in the manufacturing of the GCL including the suppliers name and production plant, as well as brand name and number.
 - d. Manufacturer's literature including:
 - Material samples;
 - Technical data including Minimum Average Roll Values (MARVs) for the items listed in GRI-GCL3;
 - Material Warranty covering materials and workmanship of the GCL, including batch identifications and associated roll numbers; and
 - Certificate of permeability and bentonite content per square foot of mat.
 - e. Copy of quality control certificates in conformance with Paragraphs 2.01 and 2.02.
2. Submittals relating to installing Contractor
- a. Background Information, including a list of completed facilities totaling one million square feet for which the Installer has installed GCL. The following information shall be provided for each facility:
 - 1) Name and purpose of facility, its location and date of installation.
 - 2) Name of owner, design engineer, manufacturer and name and telephone number of contacts at the facility who can discuss the project.
 - b. Installation capabilities:
 - 1) Information on equipment and personnel.
 - 2) Anticipated average daily production.
 - c. Shop drawings, including:
 - 1) A proposed plan detailing GCL storage location and methods;
 - 2) A proposed plan for placement and a proposed panel layout showing the installation layout identifying field seams as well as any variance or additional details which deviate from the Drawings.
 - 3) Details of seaming the GCL, anchoring, connections, penetrations and other construction details.
 - 4) The Contractor shall perform and submit the analytical testing results for the GCL at the frequencies specified in GRI-GCL3.
 - d. Installation schedule
 - e. A quality control manual that specifically defines the quality control program during

installation. The manual shall include daily procedures, installation techniques, field testing procedures, lab testing procedures, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority and all other information necessary to ensure a high quality GCL installation.

- f. Resume of the supervisor to be assigned to the project, demonstrating the supervision of one million square feet of GCL installation.
- g. A list of personnel performing field seaming operations along with pertinent experience information.

3. Material Testing Requirements



The Contractor shall contract with a lab for direct shear testing on the actual GCL, geomembrane, fabric cushion, and compacted soil liner that will be used in accordance with ASTM D6243 and ASTM D5321 that verify acceptable interface shear strength. The tests shall consist of at least 3 separate shear tests run at normal stresses (σ) of 1, 20, 40, and 60 psi. The tests shall be performed on the GCL samples hydrated a minimum of 24 hours under the normal stress at which the sample is to be sheared. The compacted soil liner shall be prepared for testing at a moisture content and dry density within the acceptance zone determined in accordance with Section 02278. The minimum acceptable effective friction angle for HDPE geomembrane is 23 degrees. Results shall include:

- Internal shear strength of the GCL
- Interface strength between the compacted soil liner material and the GCL
- Interface strength between the GCL and the HDPE geomembrane
- Interface strength between the HDPE geomembrane and fabric cushion
- Interface strength between the fabric cushion and protective cover material

Manufacturer shall submit for approval results of hydraulic conductivity test ASTM D5887 conducted using distilled water for hydration and permeant.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D2216 – Standard Test Method for Determination of Water (Moisture) Content of Soil by Mass
2. ASTM D3776 – Standard Test Method for Mass Per Unit Area (Weight) of Fabric
3. ASTM D3786 – Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method
4. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
5. ASTM D5261 – Standard Test Method for Measuring Mass per Unit Area of Geotextiles

6. ASTM D5321 – Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear
7. ASTM D5887 – Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter
8. ASTM D5888 – Standard Guide for Storage and Handling of Geosynthetic Clay Liners
9. ASTM D5890 – Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners
10. ASTM D5891 – Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners
11. ASTM D6102 – Standard Guide for Installation of Geosynthetic Clay Liners
12. ASTM D6243 – Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method

B. Geosynthetic Research Institute (GRI)

1. GRI GCL3 – Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs)

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. In addition to the manufacturer and installer requirements for qualifications and certification specified in Paragraph 1.03, the quality assurance consists of conformance testing of the material delivered to the site and field quality control during installation.
- B. Conformance testing requirements are specified in Paragraph 2.03. The purpose of conformance testing is to assure that the supplied material conforms to the Specifications and to the manufacturer's quality control certificates.
- C. Field quality control requirements are specified in Paragraph 3.06. The purpose of field quality control procedures is to assure that the GCL has been installed in accordance with the Specifications and manufacturer's recommendations.
- D. Quality Control Plan
 1. The forms for GCL quality control documentation, included in Appendix A, shall be used for field installation documentation. Alternative forms may be used for documentation as approved by the Engineer.

E. GCL Quality Control Documentation

1. Prior to commencing work, a pre-installation conference shall be held and the following Project personnel shall be identified by name and recorded in the Project files:
 - Engineer
 - Contractor's Representative
 - Engineer's Representative
 - Installation Supervisor
 - Quality Assurance Laboratory
 - Quality Assurance Technician
- a. Two duplicate project files shall be maintained. One shall be maintained by the Engineer and the other shall be maintained by the Installation Supervisor. At the end of each work week the files shall be updated and checked to assure that copies of all pertinent project information is included in each file.
- b. Blank copies of the following four project forms shall be available onsite throughout the duration of the project:

<u>Form No.</u>	<u>Title</u>
CQC - 100	GCL Project QC Log
CQC - 101	Receiving QC Log
CQC - 102	Personnel QC Log
CQC - 103	Subgrade Surface Acceptance
CQC - 104	GCL Installation Tracking Log
CQC - 105	GCL Damage Report

F. Record Drawings

1. Furnish record drawings and a copy of complete documentation for final installation of the GCL. Record drawings should detail the GCL panel Roll Number, Lot Number, and orientation in the liner system. All repairs should also be identified and located in the record drawings.

1.06 QUALIFICATIONS

A. Manufacturer

1. The manufacturer of the GCL described hereunder shall have previously demonstrated ability to produce this GCL by having at least two years continuous experience in the manufacturing of GCLs and successfully manufactured a minimum of 10 million square feet of GCL material.

B. Installer

1. The installer shall be the manufacturer or an approved installer certified by the manufacturer to install the GCL. Installation shall be performed under the constant direction of a single

Installation Supervisor who shall remain on site and be in responsible charge, throughout the GCL installation, for GCL layout, seaming, patching, testing, repairs and all other activities required by the installer.

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 in a competent, professional manner.

1.07 DELIVERY, STORAGE AND HANDLING

- A. The bentonite mat rolls shall be packaged and shipped by appropriate means to prevent damage of the bentonite mat rolls. The manufacturer shall ensure that proper methods of securing and fastening the rolls of GCL during shipping will be implemented. The CQA monitors will inspect the liner material as it arrives on site for any damage to the liner. Straps securing the liner during shipping shall not cut into the liner material. Any rolls that appear damaged as a result of tight fastening, or otherwise, may be rejected at the discretion of the Engineer. Off-loading, in accordance with manufacturer's recommendations, inspection and storage of the bentonite mat is the responsibility of the Contractor. The Contractor shall be responsible for replacing any damaged or unacceptable material at no cost to the Owner.

Handling and storage of materials shall be in accordance with manufacturer's recommendations and ASTM D5888 and is the responsibility of the Contractor.

Materials shall be protected from rain during storage and shall be dry before or during periods of rain. The GCL shall not be installed in standing water.

- B. GCL material that appears hydrated prior to or during installation will not be accepted by the Engineer. GCL material which has been hydrated prior to placement of confining stress greater than 0.75 psi shall be removed and replaced at the Contractor's expense. Hydrated GCL is defined as material which has become soft as determined by squeezing the material with finger pressure, material which has exhibited visible swelling. Exceptions to this requirement will be made at the discretion of the Engineer.
- C. No off-loading shall be performed unless the CQA Manager is present. Damage during off-loading shall be documented by the CQA Manager and CQA Technician (QAT). All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the CQA Manager.
- D. The GCL rolls shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions and excessive heat that may damage the GCL material. The rolls shall be stored on a prepared surface and shall not be stacked more than two rolls high.
- E. The GCL shall be wound around a cardboard core 4 inches in diameter to facilitate handling. The core is not intended to support the roll for lifting but should be sufficiently strong to prevent collapse during transit.

1.08 WARRANTY

- A. The GCL Manufacturer shall warrant the GCL against manufacturing defects and material degradation in its design condition for a period of five years from the date of installation. The Manufacturer shall replace at no expense any material that fails from the above causes within the warranty period. The Manufacturer shall furnish a written warranty to the Engineer covering the requirements of this Paragraph.
- B. Should a defect occur, which is covered under warranty, the Warrantor shall bear all costs for the repair and/or relocation and replacement of the GCL.

1.09 GUARANTEE

- A. The Contractor shall guarantee the GCL installation and workmanship for the period of two years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

1.10 DEFINITIONS AND RESPONSIBILITIES

A. Manufacturer

- 1. The manufacturer is the firm or corporation responsible for production of the GCL material to be used in the Project. The manufacturer is responsible for any damage to the GCL until the material is accepted by the Owner or his/her field representative upon delivery. The manufacturer shall produce a consistent product meeting the Specifications and shall provide quality control documentation for the product specified herein.

B. Installer

- 1. The installer is the firm responsible for installation of the GCL. The installer shall be the manufacturer or an approved installer by the manufacturer to install the manufacturer's GCL. The installer shall provide an Installation Supervisor responsible for the installation field crew. The installer shall be responsible for field handling, storing, placing, seaming and all other aspects of the GCL installation. The Contractor is ultimately responsible for installation of the GCL and final acceptance of the project by the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. General

- 1. The GCL shall be formulated and manufactured from polypropylene geotextiles and high swelling sodium bentonite.
- 2. The reinforced GCL shall be BENTOMAT ST, as manufactured by Minerals Technologies Inc./Colloid Environmental Technologies Company (CETCO) of Hoffman Estates, IL, BENTOLINER NSL by Solmax, Houston, TX or approved equal.

3. The materials shall be manufactured by the mechanical bonding of the needle punch process to enhance the friction characteristics of the liner and to maintain the integrity of the liner under hydration. No glues or adhesives shall be used in lieu of the needle punch process so as to retain these characteristics. Needle punched bentonite geocomposites are those which, by the process of a needling board (similar to that used in the manufacture of standard non-woven geotextiles) have fibers of a non-woven geotextile pushed through the bentonite clay core and integrated into a woven or non-woven geotextile without the use of any chemical binders or adhesives.
4. No disassociation of geotextile components from the bentonite core shall occur under any conditions.
5. The GCL shall be manufactured in accordance with GRI-GCL3. The bentonite shall meet the base mineralogical composition as listed in GRI-GCL3.
6. Rolls shall be manufactured a minimum of 12 feet wide and 100 feet long. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet (UV) light.
7. The encapsulating geotextile shall be polypropylene and shall meet the mass per unit area as listed in GRI-GCL3. The non-woven component of the geocomposite shall be a needle punched geotextile. The non-woven fabric shall be inspected by the Manufacturer for broken needles by permanently installed on-line metal detectors at the production facility. The Manufacturer must have an aggressive, thorough and effective means for ensuring that needles are detected and removed from all non-woven fabric produced. If the Engineer determines that the Manufacturer's quality assurance program is inadequate, the material may be rejected.

B. Properties

1. The GCL shall meet the minimum average properties listed in GRI-GCL3.

C. Other Materials

1. Accessory granular bentonite shall conform with the requirements listed in GRI-GCL3.

2.02 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any GCL material, the Contractor shall provide to the Owner the following information certified by the manufacturer for the delivered GCL.
 1. Origin, identification, and production of the bentonite (supplier's name, brand name and production plant).
 2. Copies of quality control certificates issued by the bentonite supplier.
 3. Each roll delivered to the Project site shall have the following identification information;
 - Manufacturer's name
 - Product identification

- GCL roll weight
 - Roll number
 - Lot number
 - Roll dimensions
4. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll identification number, sampling procedures, frequency and test results. At a minimum the test results shall be in accordance with certified requirements specified in GRI-GCL3.

2.03 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent Quality Assurance Laboratory approved by the Owner and Engineer and retained by the Contractor. A Quality Assurance Technician (QAT) from the QAL shall obtain the samples from the roll, and mark the sample with an appropriate identification number.
- B. These conformance tests shall be performed in accordance with GRI-GCL3 and include:
- Bentonite Mass per Area
 - Bentonite Free Swell
 - Bentonite Fluid Loss
 - Woven Geotextile Mass per Unit Area
 - Non-Woven Geotextile Mass per Unit Area
 - GCL Mass per Unit Area
 - GCL Index Flux
 - Peel Strength
 - Tensile Strength
- C. All conformance test results shall be reviewed by the CQA Manager and accepted or rejected, prior to the placement of the GCL. All test results shall meet, or exceed, the property values listed in GRI-GCL3. The course of action implemented for failing tests shall be approved by the Engineer. In case of failing test results, the manufacturer may request that another sample be retested by the QAL with manufacturer's technical representative present during the testing procedures. This retesting shall be paid for by the manufacturer. The manufacturer may also have the sample retested at two different laboratories approved by the Owner. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all GCL material from the lot representing the failing sample will be considered out of specification and rejected. The manufacturer reserves the right to obtain additional samples from rolls immediately before and after the failing roll or as directed by the QAT and test it by the QAL at his/her own expense. If these rolls pass, then only the failing roll will be rejected. If they fail, then the entire lot will be rejected.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Preparation of the GCL subgrade shall be as specified in Section 02278. The GCL will be placed directly over the prepared compacted soil liner subgrade.
- B. The surface shall be smooth, uniform, free from sudden changes in grade (such as vehicular ruts), rocks, stones, debris, and deleterious materials. The GCL must be maintained within the project specifications until the geomembrane has been installed. During actual placing and seaming of the geomembrane, the GCL surface shall be kept free of all standing water. If the GCL below the liner becomes wet and unstable, it shall be removed and replaced
- C. Before the GCL installation begins, the Contractor and the installer shall verify and submit to the Engineer:
 - 1. Lines and grades are in conformance with the Drawings and Specifications, verified by a field survey.
 - 2. The surface area to be lined has been rolled and compacted, free of irregularities and abrupt changes in grade.
- D. If the Contractor proceeds with installation of materials that cover the GCL prior to providing the appropriate documentation and test results verifying installation of the GCL, the Contractor will do so at his/her own risk. If the GCL is covered and failing tests are identified, the Contractor will be required to remove overlying liner system layers, repair the deficient GCL area(s) and reinstall the liner system in accordance with project specification requirements. Any liner system materials damaged during the repair work shall be replaced with new material. All costs associated with such actions will be paid for entirely by the Contractor including, but not limited to, labor, additional liner system material, testing, labor and material costs incurred by the Engineer to perform additional inspection services.

3.02 ANCHOR TRENCHES

- A. Anchor trenches shall be constructed as shown on the design drawings and as specified herein.
- B. Slightly rounded corners shall be provided in the trench to avoid sharp bends in the GCL.
- C. The anchor trench shall be adequately drained to prevent water ponding and softening of adjacent soils. The anchor trench shall be backfilled per Specification Section 02200, with common fill and compacted to 95 percent of standard Proctor, ASTM D698.
- D. The amount of trench open at any time shall be limited to one day of GCL installation capacity. The anchor trench shall be backfilled and compacted at the end of each day in accordance with the Specifications.

3.03 GCL PLACEMENT

- A. Weather Conditions
 - 1. GCL placement shall not proceed during precipitation, excessive moisture, in an area of ponded water, or excessive winds.

B. Method of Placement

1. Placement of the GCL shall be conducted in accordance with the manufacturer's recommendations and in accordance with ASTM D6102 guidelines. Any deviations from these procedures must be pre-approved by the Engineer.
2. Each panel of the GCL shall be rolled out and installed in accordance with the approved shop drawings prepared by the Contractor. The layout shall be designed to keep field joining of the GCL to a minimum and consistent with proper methods of GCL installation.
3. GCL rolls shall be placed using proper spreader and rolling bars with chain or cloth slings. If a sheet must be replaced a distance greater than its width, a slip or rub sheet shall be used.
4. The QAT and CQA monitors shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, as approved by the Engineer.
5. The installer shall avoid dragging the GCL sheets on soil subgrades.
6. All GCL shall be anchored as shown on the Drawings and consistent with manufacturer's recommendations. Seams shall be perpendicular to the toe of slope at all times.
7. The GCL shall be properly weighted to avoid uplift due to wind.
8. Vehicular traffic across the GCL shall not be allowed unless approved by the Engineer. Use of a low ground pressure all-terrain vehicle (ATV) that exerts a maximum of 6 psi may be allowed as standard operating procedure for deployment of geomembrane if endorsed by the Manufacturer in writing and approved by the Engineer.
9. All damage shall be recorded and located in the record drawings.
10. The GCL shall be kept free of debris, unnecessary tools and materials. In general, the GCL area shall remain neat in appearance.
11. Equipment necessary to perform the installation (generators, compressors, etc) shall have a scrap GCL sheet placed underneath to protect the installed GCL from possible damage.
12. In the opinion of the CQA Manager, any seam, or edge of GCL material exposed for more than 24 hours or considered partially hydrated when seaming occurs shall receive a minimum 3-foot overlap (rainlap) from the adjoining GCL panel.
13. The Contractor shall only work on an area that can be completed in one working day. Completion shall be defined as the full installation and anchoring of the GCL liner and placement of the specified liners or cover soils. Upon completing placement of bentonite panels in any area, the HDPE geomembrane shall be immediately installed over bentonite panels as detailed in Section 02776. Under no circumstances will the Engineer allow the

GCL to be exposed to the elements overnight.

14. The minimum allowable size for a GCL "panel" shall be 120 square feet.
15. The GCL shall not get wet before or during installation. The GCL shall not be installed during periods of precipitation. If a precipitation event occurs after the installation of a GCL panel, but prior to covering with geomembrane, a thin film plastic sheeting may be used to cover and to temporarily protect the GCL from moisture, if approved by the Engineer.
16. GCL material that appears hydrated prior to or during installation will not be accepted by the CQA Manager. GCL material, which has been hydrated prior to placement of confining stress greater than 0.75 psi, shall be removed and replaced at the Contractor's expense. Hydrated GCL is defined as material which has become soft as determined by squeezing the material with finger pressure, material which has exhibited visible swelling, or material which has a moisture content greater than 50 percent as determined by ASTM D2216.
17. For protection and proper performance, no machinery or equipment shall be allowed on the GCL, unless previously approved by the Engineer and Manufacturer. A low tire pressure vehicle (i.e., all terrain vehicles) may be used to install the HDPE over the GCL if the GCL is dry, if approved by the Engineer and Manufacturer. Vehicles, machinery, or equipment shall be operated to avoid abrupt stops, starts, or turns.
18. GCL panels shall be placed with the non-woven geotextile side facing up. On sloped areas exceeding a steepness of 4H:1V, the long dimension of all panels shall be oriented parallel to the slope. Panels should be placed from the highest elevation to the lowest within the area to be lined, to facilitate drainage in the event of precipitation. 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. Panels shall not be dragged across the subgrade into position except where necessary to obtain the correct overlap for adjacent panels. Panel ends shall not be closer than three feet from the top or toe of slopes.
19. When covering GCL installed on sloped areas steeper than 4H:1V, the cover material should be pushed upslope to minimize tension on the GCL.
20. Any leading edge of panels left uncovered shall be protected at the end of the working day with a waterproof sheet which is adequately secured with sandbags and other ballast.
21. Reinforced GCL panels on sideslopes shall extend a minimum of 10 ft beyond the interface of the steep sideslope and the bottom

C. Liner Penetrations

1. GCL aprons or shrouds shall be furnished and installed where indicated on the Drawings. The aprons shall be of the same material as the GCL.

2. Aprons and shrouds shall fit snugly around the pipe.
3. For any penetrations or structures the GCL will contact, a small notch (approximately 3 inches wide and 8 inches deep) shall be cut against the edge of the subgrade area. The GCL shall be brought up to the edge of the structure and trimmed to fit into the notch. The Contractor shall then hand-apply a pure bead of bentonite into half the notch. The GCL shall then be inserted into the notch, with the remaining volume of the notch refilled with the pure bentonite and compacted.

3.04 FIELD SEAMS

- A. Individual panels of GCL shall be laid out and overlapped by a minimum of 24 inches for end seams and minimum of 6 inches for side seams prior to seaming. The area to be seamed shall be cleaned and prepared prior to placement of granular bentonite, if required by manufacturer's recommendations.
- B. All seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the record drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be seamed.
- C. Seam areas or runs shall also be flat and clear of any large rocks, debris, or ruts. Contacting surfaces shall be clean and clear of dirt or native soil with all edges pulled tight to maximize contact and to smooth out any wrinkles or creases. Overlaps shall be verified by the CQA manager.
- D. Seams shall be augmented with granular bentonite to ensure seam integrity, if required by manufacturer's recommendations. Granular bentonite shall be dispersed evenly from the panel edge to the lap line at a minimum rate of 1/4 pound per lineal foot continuously along all seams or overlap areas. Accessory bentonite shall be of the same type as the material within the composite liner itself.
- E. All seams constructed on sloped surfaces shall be vertical seams.
- F. On gently sloping areas (gentler than 4H:1V) where seams may be placed across the slope, overlaps should be "shingled" so as to prevent flow into the seam.

3.05 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the Contractor shall dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

3.06 FIELD QUALITY CONTROL

- A. Repair Procedures
 1. Any portion of the GCL exhibiting signs of defect shall be repaired. The following

procedure should be used to repair these areas. The final decision as to the appropriate repair procedure shall be made by the Engineer.

Large rips or tears shall be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch over the damage, with a minimum overlap of 12 inches on all edges. Accessory bentonite shall be placed between the patch and the repaired material at a rate of 1/4 pound per lineal foot of edge, spread in a 6-inch width. The above procedures shall also be implemented if a rip or tear occurs on a sloped surface. In this instance, the edges of the patch shall be fastened to the repaired liner with construction adhesive, in addition to the bentonite-enhanced seam.

B. Repair Verification

1. Each repair shall be numbered and logged by the installer and located on the as-built drawings. The QAT and CQA Staff shall observe repairs. The installer shall record the number of each repair and the date the repair was made.

END OF SECTION 02277

APPENDIX A

The following forms are included and shall be completed by the responsible party as shown on the forms.

<u>Form No.</u>	<u>Title</u>
CQC - 100	GCL Project QC Log
CQC - 101	Receiving QC Log
CQC - 102	Personnel QC Log
CQC - 103	Subgrade Surface Acceptance
CQC - 104	GCL Installation Tracking Log
CQC - 105	GCL Damage Report

FORM CQC - 100
GCL PROJECT QC LOG
(one sheet per project)

PROJECT

NAME: _____

NUMBER: _____

LOCATION: _____

OWNER: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

ENGINEERING

ENGINEERING FIRM: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

CONTRACTOR

GENERAL CONTRACTOR: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

SUPPLIER OF GCL MATERIALS

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

QC INSPECTION

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

FORM CQC - 100
GCL PROJECT QC LOG
(one sheet per project)
(Continued)

TESTING LABORATORY

GCL TESTING LABORATORY: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

FABRICATOR OF MATERIAL

NAME: _____

ADDRESS: _____

CONTACT: _____

INSTALLER OF MATERIAL

NAME: _____

ADDRESS: _____

CONTACT: _____

GCL MATERIALS

SPECIFIED GCL MATERIALS: _____ TYPE: _____

MATERIAL CERTIFICATION

MATERIAL CERTIFICATION RECEIVED: _____

DATE: _____ ACCEPTED: _____

FORM CQC - 101
RECEIVING QC LOG
(one sheet per truck)

PROJECT NAME: _____

DATE: _____ TIME: _____ PROJECT NUMBER: _____

TRUCKERS ID: _____

NO. OF PIECES ON BOARD: _____ AGREE WITH PACKING LIST? _____

CONDITION OF PACKAGING: _____

VERIFY PROPER MATERIALS: _____ VERIFY PROPER TYPE: _____

IDENTIFY ROLL NUMBERS: _____

IDENTIFY ACCESSORIES _____

IDENTIFY DAMAGED ITEMS: _____

TYPE OF UNLOADING EQUIPMENT USED: _____

OPERATOR: _____

COMMENTS: _____

STORAGE AREA

CONDITION (*surface*): _____

LOCATION TO PLACEMENT AREA: _____

MATERIAL PROPERLY COVERED: _____

WEATHER

CONDITIONS: _____ TEMP: _____

SIGNATURES

QC INSPECTOR: _____

SITE SUPERVISOR: _____

Use back for other comments

FORM CQC - 102
PERSONNEL QC LOG
(installation personnel)
(complete for each mobilization or change of personnel)

PROJECT NAME: _____

DATE: _____ PROJECT NUMBER: _____

SAFETY MEETING CONDUCTED ON MATERIALS HANDLING: _____

GIVEN BY: _____ DATE: _____

SUPERINTENDENT OF INSTALLATION: _____

INSTALLATION CREW PERSONNEL

#1 CREW LEADER: _____ HELPER: _____

#2 CREW LEADER: _____ HELPER: _____

#3 CREW LEADER: _____ HELPER: _____

#4 CREW LEADER: _____ HELPER: _____

#5 CREW LEADER: _____ HELPER: _____

#6 CREW LEADER: _____ HELPER: _____

#7 CREW LEADER: _____ HELPER: _____

#8 CREW LEADER: _____ HELPER: _____

OTHER CREW MEMBERS

NAME: _____ NAME: _____

NAME: _____ NAME: _____

NAME: _____ NAME: _____

SIGNED: _____

QC Inspector

FORM CQC - 103
SUBGRADE SURFACE ACCEPTANCE
(once sheet per Day of GCL Deployment)

1. Surface for GCL placement accepted, covered by panel numbers:

Approximate size of area: _____

**CERTIFICATE OF ACCEPTANCE
OF SUBGRADE SOIL BY INSTALLER**

I the undersigned, duly authorized representative of _____ do
hereby accept the soil liner surface as being acceptable for the placement of GCL.

Name	Signature	Title	Date
------	-----------	-------	------

Certificate Accepted by Inspector - Company: _____

Name	Signature	Title	Date
------	-----------	-------	------

QC INSPECTOR: _____

SITE SUPERVISOR: _____

INSTALLING SUPERVISOR: _____

COMMENTS

FORM CQC - 104
GCL INSTALLATION TRACKING LOG

[illegible]

FORM CQC - 105
GCL DAMAGE REPORT

JOB NAME: _____ JOB NO.: _____ PAGE: _____

DATE	PANEL NO.	SEAM NO.	LOCATION OF DAMAGE	TYPE OF DAMAGE	TYPE OF REPAIR	PATCH NO.

COMMENTS: _____

SECTION 02278

COMPACTED SOIL LINER

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to install compacted low permeability soil liner of 18-inch minimum thickness below geosynthetic clay liner (GCL) as shown on the Drawings and as specified herein. Associated work includes quality control testing, borrow source excavation, hauling, screening, constructing test pads, placement, moisture conditioning, harrowing, compaction, and grading of compacted low permeability soil liner.
- B. The Contractor shall be responsible for all submittals required for Engineer approval of off-site borrow sources.

1.02 RELATED WORK

- A. Section 02200: Excavation, Backfill, and Compaction
- B. Section 02277: Geosynthetic Clay Liner (GCL)

1.03 SUBMITTALS

- A. Within 15 calendar days following the Effective Date of the Agreement, the Contractor shall submit the following information as a complete package in accordance with Section 01300:
 - 1. Identification of the compacted low-permeability soil liner source. Submit the following documentation:
 - a. Name of the proposed low-permeability soil source and location relative to the site.
 - b. Test results and other documentation as necessary to verify that the proposed low permeability soil meets the requirements of Paragraph 2.01A of this Section and that a sufficient volume of the material is available to the project from the proposed borrow source. Include a map of the borrow source showing locations of test pits excavated to collect conformance test samples. Minimum testing frequencies for initial conformance testing are specified in Paragraph 2.02A.
 - 2. A signed certification letter, with all necessary permits, that the material source is in full compliance with State, County, and local laws and regulations.
 - 3. A description and schedule of the proposed installation procedures for low permeability soil liner construction. Include a list of installation equipment and the procedures for providing survey control during low permeability soil liner construction. If grade stakes

are proposed for survey control, submit a map showing proposed metal grade stake locations and inventory numbering system (refer to Paragraph 3.04E).

4. A Construction Quality Control (CQC) Plan for the low permeability soil liner installation including:
 - a. CQC procedures for monitoring and testing at the borrow source and for test pad construction.
 - b. CQC procedures for compacted low permeability soil liner installation including the removal of oversized stones and organic matter from the soil liner material, moisture control, placement, compaction and lift thickness control.
 - c. Procedure for grade stake recovery and inventory, if grade stakes are proposed for survey control during the low permeability soil liner installation.
 - d. Procedure for restoration of field density test locations, depth check locations, grade stake locations and permeability test sampling locations.
 - e. Procedure for protection of liner from adverse weather conditions (precipitation, frost, or intense heat).
 - f. All other relevant procedures.
- B. At least 21 calendar days prior to test pad construction, submit at least 250 lbs of the proposed compacted clay liner material, if on-site sources are not adequate, contained in sealed 5-gallon pails to the Quality Control Laboratory (QCL).
- C. Prior to compacted low permeability soil liner construction, submit a survey map of the final prepared subgrade elevations in a form acceptable to the Engineer.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 1. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils
 2. ASTM D698 - Standard Test Method for Laboratory Compacted Characteristics of Soil using Standard Effort (12,400 ft-lbf/ft³ (600 KN-m/m³))
 3. ASTM D854 - Standard Test Method for Specific Gravity of Soils Solids by Water Pycnometer
 4. ASTM D1140 - Standard Test Method for Amount of Material in Soils Finer than the Number 200 (75 micrometer) Sieve
 5. ASTM D1556 - Standard Test Methods for Density and Unit Weight of Soil in Place by Sand-Cone Method

6. ASTM D1557 - Standard Test Methods for Laboratory Compacted Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft³ (2,700 KN-m/m³))
 7. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 8. ASTM D2487 - Standard Classification of Soils for Engineering Purposes
 9. ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)
 10. ASTM D2937 - Standard Test Method for Density of Soils in Place by the Drive-Cylinder Method
 11. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 12. ASTM D3017 - Standard Test Method for Water Content of Soil in Place by Nuclear Methods (Shallow Depth)
 13. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
 14. ASTM D4767 - Test method for Consolidated - Undrained Triaxial Compression Test on Cohesive Soils
 15. ASTM D5084 - Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
 16. ASTM D5321 - Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic friction by the Direct Shear Method
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE AND QUALITY CONTROL

- A. The Owner shall retain an independent geotechnical QCL that is experienced in the construction of low permeability liners and capable of performing the tests specified herein. The QCL shall provide direction and testing as necessary to control the quality of the borrow material (material property requirements specified in Paragraphs 2.01A) and proper construction of the test pad and the low permeability liner.
- B. Contractor shall coordinate his work with the Owner's QCL to allow testing and monitoring of all work components to proceed.

- C. There shall be no additional compensations to Contractor for any construction delays caused by Contractor's failure to plan, coordinate, and schedule work to include all CQA activities.
- D. Conformance testing requirements are specified in Paragraph 2.02. The purpose of conformance testing is to assure that the liner material delivered from the borrow source consistently meets the requirements of the specifications. In the event that the material from the initial borrow source varies significantly, fails to conform to the required criteria or fails to contain sufficient volume of suitable soil to complete the liner, the Contractor may locate another source, and upon submission and approval of results of initial conformance tests specified in Paragraphs 2.01 and 2.02, may submit samples from the new source for acceptance zone testing by the QCL, followed by construction of additional test pads, with all related costs born by the Contractor including engineering, laboratory testing and construction quality assurance.
- E. If necessary, the Contractor shall arrange for a site inspection of the low permeability borrow source(s) by the QCL and Engineer after initial conformance test data have been submitted and approved and prior to stockpiling low permeability on the site for the purpose of coordinating quality control and quality assurance procedures for borrow source excavation and stockpiling of material on-site.
- F. A test pad shall be constructed on site using the same equipment and installation procedures that will be used during full scale soil liner construction. The purpose of the test pad is to assure that the construction procedures followed will produce an acceptable soil liner. Construction requirements and testing procedures for the test pad are specified in Paragraph 3.01.

1.06 QUALIFICATIONS

- A. The work shall be performed by personnel that have experience in processing and installation of low permeability soil liners.
- B. The Contractor shall show evidence of an adequate, homogenous supply of material within a designated area which is properly permitted by the appropriate local, State and Federal agencies.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Soil materials for low permeability soil liner construction shall be stockpiled onsite in designated areas approved by the Engineer. The low permeability soil liner material shall be stockpiled separately from other materials. Soil material containing oversized rocks, roots, stumps, topsoil or other organic matter shall not be stockpiled on the site in the designated low permeability soil liner stockpile areas. Removal and placement of stockpiled material shall be done in a manner to minimize mixing with soils adjacent to and beneath the stockpile.
- B. The Contractor shall protect the low permeability soil materials delivered to the site from inclement weather conditions and any traffic that may occur near the stockpile.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Compacted low permeability soil liner materials, shall consist of natural mineral soil that is uniform in character, free from fill materials, organic materials, loam, wood, trash, snow, ice and other objectionable materials and shall conform to the following properties:

	<u>Property</u>	<u>Standard</u>	<u>Requirement</u>
1.	Passing the 1-inch Sieve	ASTM D422	100%
2.	Passing the 200 Sieve	ASTM D1140	40% minimum
3.	Liquid Limit	ASTM D4318	30% minimum
4.	Plasticity Index	ASTM D4318	10% minimum
5.	USCS Soil Classification	ASTM D2488	SC, CH, CL, MH
6.	Hydraulic Conductivity	ASTM D5084	1.0×10^{-5} cm/s max
7.	Interface Friction Angle	Direct Shear ASTM D5321	23° minimum (interface with synthetic rotational shear liner) or as approved by Engineer
8.	Internal Friction Angle	ASTM D4767	23° minimum or as approved by Engineer
9.	Organic Content	ASTM D2974	5% maximum

- B. The material proposed for the compacted soil liner construction shall be uniform in character and after compaction, shall have an in-place saturated hydraulic conductivity of 1.0×10^{-5} cm/s or less based on testing according to Paragraph 3.01 (F) of this Section.
- C. To provide consistency in the particle size, clay content, and moisture content of the Compacted Soil Liner, Contractor may need to excavate, mix and blend, and stockpile the materials in an on-site staging area.
- D. The compacted soil liner material shall be tested by the QCL for interface friction with the GCL according to the requirements of ASTM D5321 and should have a friction angle of at least 23° for the range of normal stress indicated below. Testing should be conducted according to the following:
1. Test specimens shall be compacted to 95% of maximum dry density as determined by ASTM D698 unless otherwise specified by the Engineer.

2. Normal stresses representing field conditions expected prior to waste placement and after waste placement should not be used. The normal stresses shall be 1, 20, 40 and 60 psi.
3. If normal stresses less than 5 psi are applied, dead weights should be used to apply normal stresses.
4. Test shall be conducted so that the normal stress is applied to the soil and the soil is moved against the stationary membrane.

Interpretation of the angle of the test data failure envelope (i.e. interface friction angle) shall be based on a best-fit line through the test failure condition data with a y-intercept of zero.

- E. The internal friction angle of the soil liner shall be measured using consolidated-undrained triaxial tests with pore pressure measurements (ASTM D4767). Test specimens shall be compacted to 95% of maximum dry density as determined by ASTM D698 unless otherwise specified by the Engineer. Effective consolidation pressures representing field conditions expected prior to waste placement and after waste placement should be used. Consolidation pressures shall be 1, 15, 30 and 50 psi. The test results shall include stress-strain curves, pore pressure measurements, stress path photos and Mohr circle plots.

2.02 CONFORMANCE TESTING

- A. Initial conformance testing shall be performed by the QCL on samples of the proposed low permeability soil at the rate of at least one series of tests per 30,000 cubic yards of soil. A test series shall include the tests specified in Paragraphs 2.01A. Test samples shall be obtained from test pits excavated throughout the borrow source under the direction of the QCL to characterize the full extent of the borrow source.
- B. The QCL will determine an acceptable zone of moisture contents and dry unit weights for which the strength and permeability requirements are met by performing the following testing and analysis procedures:
 1. Using representative samples of the low permeability soil that were excavated from borrow source, perform a standard Proctor compaction test to develop a moisture-density curve for the material. Use up to five specimens prepared at different moisture contents to develop the moisture content vs. dry density curve.
 2. Prepare up to five flexible wall permeability test samples, each at a dry density and moisture content combination determined by the Engineer based on the results of the standard Proctor test and index tests. Permeate each compacted specimen to determine its hydraulic conductivity in accordance with Paragraph 3.01F.
 3. On the graph of dry density vs. moisture content, identify the samples which have hydraulic conductivities less than or equal to 1×10^{-5} cm/s.

4. Perform consolidated undrained triaxial compression tests (ASTM D4767) on specimens prepared at the high moisture/low dry density end of the acceptance zone and plot friction angles as a function of molding water content.
 5. Based on the hydraulic conductivity test results, shear test results and other pertinent factors such as potential for desiccation cracks, constructability, shrink/swell potential and consolidation, the QCL will prepare an acceptance zone for the material.
 6. The QCL will define the acceptance zone as described above for one material source at the expense of the Owner. If additional sources are used, the tests described above shall be performed by the QCL and the costs will be paid by the Contractor.
- C. The QCL personnel shall monitor each delivery of material from the borrow source, and note, on an approved form, the classification of the soil by visual-manual procedures (ASTM D2488), color of the material, date, time, and approximate quantity of material brought onsite and submit two (2) copies of completed forms to the Engineer at the end of each work day.
- D. The low permeability soil shall be tested by the QCL prior to use on the site at the frequencies listed below. The QCL shall ensure that the low permeability soil is free of oversized rocks and organic matter such as roots, stumps, leaves and branches and other deleterious matter as it is being spread over the landfill prior to compaction. If changes occur in material, as identified by the Engineer, additional tests shall be performed at the expense of the Contractor.

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Grain Size (sieve only)	ASTM D422	Every 2,000 cy or change in material
Atterberg Limits	ASTM D4318	Every 2,000 cy or change in material
Moisture/Density	ASTM D698	Every 4,000 cy or change in material
Natural Moisture	ASTM D2216	Every 1,000 cy or change in material

Results of the tests shall be submitted to the Engineer within 24 hours of test completion and prior to use of the material on site.

PART 3: EXECUTION

3.01 TEST PAD

- A. At least one test pad meeting all testing requirements with dimensions of not less than 40-ft by 60-ft and 18-in thickness and not more than 80-ft by 120-ft and 18-in thickness shall be constructed onsite using the same equipment, subgrade preparation procedures, and materials processing and installation procedures that will be used during full-scale cover construction. If

approved by the Engineer, the test pad may be installed within the liner limits and incorporated in the work, provided all testing requirements are met.

- B. The construction of the test pad shall be directed by the QCL. The QCL shall use the established acceptance zone established to set moisture contents and percent compaction. The QCL shall perform tests as needed to assist in the construction of the test pad.
- C. The final compacted thickness of each lift shall be a maximum 6-inch lift thickness. For each lift, the QCL will perform testing of moisture content and density at a minimum of three test locations. Two thin-wall tube samples (ASTM D1587) shall be obtained per lift by the QCL. One tube will be used to perform a permeability test. The second tube will be kept as a backup in case of damage to the first sample.
- D. If the initial test pad does not provide the specified results, additional test pad(s) shall be performed, at the Contractor's cost (including CQA costs), until the specified requirements are met.
- E. The Contractor may construct test pads for more than one source of low permeability liner material. However, only one test pad will be tested and evaluated at the Owner's cost as a part of the specified construction quality assurance (CQA). All costs associated with subsequent test pads shall be paid for by the Contractor. If the Contractor changes the source of low permeability soil, or if the characteristics of the low permeability soil within the selected source changes significantly, the Engineer may order the construction of additional test pads as specified above to evaluate the performance of the compacted low permeability liner. Construction of additional test pads and the related CQA work shall be paid by the Contractor.
- F. One triaxial hydraulic conductivity test (ASTM D5084) will be performed on a sample obtained from each lift of the test pad. These tests will be performed on undisturbed thin-wall tube samples collected by the QCL in accordance with ASTM D1587. The samples shall be trimmed if needed, encapsulated within a flexible latex membrane, and mounted in permeameters conforming to the requirements of ASTM D5084. Each test specimen shall be consolidated under an effective stress of 1 to 3 psi and permeated under a back pressure as recommended in Paragraph 8.3 of ASTM D5084 to achieve saturation. The maximum hydraulic gradient across the sample shall not exceed thirty (30) as per Paragraph 8.5.1 of ASTM D5084 or as specified by Engineer. The hydraulic gradient shall be increased slowly in increments with careful observations of the test sample for consolidation, piping, etc. Test samples that are consolidated in volume by more than 5 percent during the test shall be voided. The inflow and outflow from the sample shall then be monitored and the hydraulic conductivity calculated for each recorded flow increment. The tests will continue until steady state flow is achieved as specified in Paragraph 8.5 of ASTM D5084.
- G. The low permeability liner thickness shall be determined from three test locations per lift selected by the QCL per test pad using a method consisting of hand augering or push tube sampling (with a minimum of a ¾-inch diameter sample) or as approved by the Engineer.

3.02 SUBGRADE PREPARATION

- A. The subgrade shall be graded in accordance with the plans.

- B. The low permeability liner subgrade shall be compacted by the Contractor under direction of the QCL and observation by the Engineer until sufficiently stable for low permeability soil liner construction. Any unsuitable areas encountered at subgrade elevation shall be removed and replaced or recompacted as necessary to create a stable subgrade for liner construction.
- C. Select Fill shall be placed to replace unstable subgrade material in the low permeability liner area. Select fill shall be compacted to at least 95 percent of maximum density as determined by ASTM D698 or higher if necessary to create a stable subgrade for the low-permeability soil liner.
- D. The Engineer shall observe and approve the subgrade and the survey plan of subgrade elevation submitted by the Contractor before installation of the low permeability liner can proceed. It shall be the Contractor's responsibility to properly prepare and maintain the subgrade in a uniform and compacted condition during installation of the liner.
- E. If the subgrade is damaged during liner installation, the Contractor shall restore and recompact the area and the QCL shall retest the subgrade in accordance with ASTM D1556 or D2937 prior to installing the liner. All costs related to the retest and restoration of the subgrade shall be paid for by the Contractor.

3.03 LOW PERMEABILITY SOIL LINER PLACEMENT

- A. The QCL shall supervise the liner installation. Work shall not be performed by the Contractor without the QCL at the liner installation work area. The QCL shall perform field tests (i.e. moisture content, densities, etc.) as required to ensure proper installation. The QCL shall perform tests as described in Section 3.04 to determine acceptance of the in-place compacted low permeability liner after the Contractor indicates that an area is ready for testing.
- B. The placement moisture content shall be within the acceptance zone determined by the QCL. The acceptance zone may be modified by the Engineer based on results and observations of the test pad.
- C. Water for Compaction
 - 1. The Contractor shall provide water as required to maintain the moisture content of the in-place and stockpiled low permeability soil liner material within the acceptance zone.
 - 2. The water shall be of potable quality.
 - 3. Prior to installing the liner, the Contractor shall inspect the subgrade to ensure that it has been sufficiently wetted to prevent excessive absorption of moisture from the installed low permeability soil liner material.
 - 4. Should the material be stockpiled for any length of time, the Contractor shall slope, seal and compact the stockpile to prevent erosion and oversaturation.

5. Should the material become oversaturated, the Contractor shall spread and dry the material as needed to adjust the moisture to the proper percentage.
- D. The materials shall be uniformly compacted to no less than the minimum dry density of the acceptance zone. Density shall be uniformly obtained throughout the entire thickness of the liner. The liner shall be constructed in lifts with a maximum compacted thickness of 6 inches per lift to assure achievement of the specified compaction in the lower part of the liner. The surface of a lower lift shall be scarified prior to placement of an upper lift. However, the subgrade of the compacted low permeability liner shall not be scarified. During placement of the initial lift, care should be taken to avoid mixing of the liner material and subgrade material. To achieve the specified compaction the Contractor shall use a self-propelled compactor such as the Caterpillar 815, or an equivalent, which provides steel kneading feet capable of fully penetrating the loose lift and into the previously compacted lift, in spreading and kneading the materials. Finally, a smooth wheel compactor such as a Caterpillar CS553 shall be used with sufficient number of passes to smooth the upper surface of the low permeability liner. This type of compactor shall be used only for final smoothing of the surface. It shall not be used for achieving the specified compaction.
- E. Liner material shall be disked, harrowed, and kneaded as necessary to break down all clods and produce a uniform material that is free of clods. A clod is defined for the purposes of construction as any sub-rounded ball of low permeability soil exceeding 1½-inch in diameter, typically with the core containing less than the specified moisture. If the Engineer observes that all clods have not been broken down, the Contractor shall rework the material to the satisfaction of the Engineer.
- F. Liner material which has been contaminated with clusters of rock or gravel, sand lenses, organic debris or other deleterious material shall be removed and replaced with uncontaminated low permeability materials.
- G. For the final lift, the Contractor shall employ a crew of laborers to remove all rocks 1 inch in largest dimension prior to smooth rolling.
- H. No liner material shall be placed, spread, or compacted while the ground or the liner material is frozen/thawing, saturated, desiccated, or during unfavorable weather conditions or periods of precipitation. The liner surface shall be made smooth and free from ruts or indentations at the end of any working day when significant precipitation is forecast and/or at the completion of the compaction operations in that area in order to prevent saturation of the liner material. Any regrading due to the above conditions or final preparation should be retested at those locations for liner thickness prior to placement of the next lift. Thickness measurements should be performed as indicated in Section 3.04 A. Areas previously meeting the conformance test requirements that are reworked in excess of the top 3-inch per lift shall be retested. Retesting will be at the cost of the Contractor.
- I. Work shall be limited to an area where a lift can be completed in one working day. Completion of a lift shall be defined as the construction of a lift that is homogeneously installed with moisture content and density within the acceptance zone, free of organic materials and oversized rocks and possessing a smooth rolled surface.

- J. If a lift is not to receive a subsequent lift within 16 hours of its completion, the lift shall be sealed with a smooth wheel compactor, such as the caterpillar CS553, at the end of each day's work to protect the liner from desiccation. Should desiccation cracks develop, the liner shall be scarified, disked, rewetted, rehomogenized and recompacted in accordance with the Specifications to the depth of any such cracks or as instructed by the Engineer. If desiccation extends below ½ the lift thickness, the entire lift shall be reworked and retested as described above. Retesting will be at the expense of the Contractor.
- K. During construction, the Contractor shall make all necessary provisions to deal with inclement weather conditions. The Contractor shall be fully responsible for control of stormwater during installation of the cover system and for moisture control and protection of the low permeability soil liner against erosion.
- L. After finish grading and smooth rolling is completed, the compacted low permeability soil liner shall not be less than 18 inches in any location and the surface shall not contain roots, other organic matter or stones larger than one inch in diameter. Liner thickness will be tested by the QCL on a per lift basis at a frequency specified in 3.04A using a method of hand augering or push tube sampling (minimum 3/4" sample). Each test shall penetrate all underlying lifts to the subgrade elevation. The thickness shall be measured from top of subgrade to top of low permeability liner. Areas not meeting the thickness requirements shall be augmented with additional low permeability soil material at the expense of the Contractor. The final low permeability soil liner thickness will be determined from the Contractor's survey. The Contractor's surveyor shall be available to assist in determining the areal extent of low permeability soil liner and areas of less than 18 inches measured perpendicular to slopes. Any additional testing or CQA services associated with corrective action for achieving the 18-inch liner thickness requirement will be at the cost of the Contractor. The added material shall be worked into the in-place liner to ensure homogeneity and proper bonding. This shall be done by scarification of the surface prior to addition of the new material. As a minimum, the top 3-inches of the liner shall be wetted, kneaded, compacted and reworked with a Caterpillar 815 or equivalent to bond the additional material with the previous lifts to obtain the required thickness. The upper surface of the low permeability soil liner should then be rolled with a smooth wheel compactor such as a Caterpillar CS553 or equivalent prior to final low permeability soil liner thickness determination by the Contractor's surveyor.

3.04 TESTING DURING PLACEMENT

- A. The QCL shall conduct the following tests during installation of the compacted low permeability soil liner at the specified minimum frequencies. The QCL shall provide direction and testing as necessary to the Contractor to control quality of the low permeability soil liner materials as specified herein.

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Density	ASTM D2937 or ASTM D2922	4/acre/lift
Natural Moisture	ASTM D2216 or	4/acre/lift

	ASTM D3017	
Undisturbed Permeability	ASTM D5084	1/two acre/ lift
Natural Moisture of Undisturbed Permeability Sample	ASTM D2216	1/two acre/lift
Atterberg Limits of Undisturbed Permeability Sample	ASTM D4318	1/two acre/lift
Atterberg Limits	ASTM D4318	2/acre/lift
Grain Size (sieve only)	ASTM D422	2/acre/lift
Liner thickness	Hand auger or push tube	4/acre

- B. All holes made as a result of depth measurements, permeability samples, density tests, grade stakes or other activities shall be completely filled by the Contractor with bentonite, soil-bentonite mix, or low permeability liner soil, as instructed by the Engineer.
- C. The Engineer shall have the authority to request additional permeability tests in areas that, in the Engineer's judgement, may be suspect or deficient. Hydraulic conductivity tests shall be conducted in accordance with ASTM D5084 except as modified in Paragraph 3.01F. For each sample tested, one back-up sample will be extracted in the proximity of the sample location. This sample will be held in a controlled environment at the QCL laboratory as a backup sample for future testing, if needed. If adequate demonstration is presented that a sample was not representative of the low permeability soil liner or that an error in testing occurred, the backup sample will be tested and the original test will be disregarded.
- D. Any sample or area tested shall be rejected, removed and replaced if it does not meet the requirements of the technical specifications. Reconstructed areas shall have feathered, overlapping edges that tie into adjacent liner areas.
- E. The Contractor shall provide survey control in the field for the QCL to reference sample locations. If grade stakes are provided in the field for this purpose, the grade stakes shall be numbered by the Contractor and located on an inventory map. The inventory map shall be submitted to the Engineer. Upon completion of an area, the removed stakes shall be compared to the inventory map to ensure that none were left in-place. Only metal stakes are acceptable.
- F. The Contractor shall submit a survey plan with final elevation of top of low permeability soil liner for Engineer's approval in accordance with Section 01050 and Section 01300 prior to GCL installation. The required thickness will be measured perpendicular to slopes.

3.05 Corrective Action

If soil has been desiccated to a depth less than or equal to the thickness of a single lift, the desiccated lift shall be disked, moistened, and recompact. However, disking may produce large, hard clods of low permeability soil that will need to be pulverized before moisture conditioning. Also, it should be recognized that if the soil is wetted, time must be allowed for water to be absorbed into the low permeability soil and hydration to take place uniformly. For this reason, it will be necessary to remove the desiccated soil from the construction area, to process the lift in a separate processing area, and to replace the soil accordingly.

END OF SECTION 02278

SECTION 02279
STORMWATER TARP

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install stormwater tarp in the locations shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. 02700: Protective Cover Aggregate

1.03 SUBMITTALS

- A. Within 30 calendar days following the Effective Date of the Agreement, submit the following information in accordance with Section 01300:
 - 1. Manufacturer's background information.
 - 2. Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - 3. List of material properties and samples of scrim reinforced tarp with attached certified test results.
 - 4. Manufacturer's quality control program and manual including description of laboratory facilities.
 - 5. A list of ten completed facilities where the scrim reinforced tarp is used including:
 - a. Name and purpose of facility, its location and date of installation.
 - b. Name of Owner, project manager, design engineer and installer.
 - c. Tarp thickness and surface area.
 - d. Information on performance of the facility.
 - 6. Shop Drawing, including:
 - a. Details of overlap and seaming of the tarp, anchoring, and other construction details as well as any variance or additional details that deviate from the Drawings.

7. Installation schedule.
8. A manual that specifically defines the quality control and quality assurance program during installation including manufacturer's installation instructions.
9. Copy of quality control certificates in conformance with Paragraph 2.03.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 1. ASTM D751 – Standard Test Methods for Coated Fabrics
 2. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
 3. ASTM D1603 - Standard Test Method for Carbon Black in Olefin Plastics
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 SYSTEM DESCRIPTION

- A. The stormwater tarp shall be installed over the protective cover aggregate as shown on the Drawings.

1.06 DELIVERY, STORAGE AND HANDLING

- A. The stormwater tarp shall be shipped, stored and handled in accordance with manufacturer's recommendations.
- B. The tarp shall be stored such that it is protected from exposure to sunlight and it shall be elevated from the ground (a minimum of 3-in) to protect the tarp from puncture and soil staining.

1.07 PROJECT/SITE REQUIREMENTS

- A. The protective cover aggregate layer shall be inspected and approved by the Engineer prior to installation of the tarp.

1.08 MATERIAL WARRANTY

- A. The tarp manufacturer shall warrant the material, against manufacturing defect and material degradation (on a prorated basis) for a period of ten years from the date of installation. The manufacturer shall replace any material which fails from the above causes within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this Paragraph.

1.09 GUARANTEE

- A. The Contractor shall guarantee the tarp against defects in installation and workmanship for the period of two years commencing with the date of Final Acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Owner.

PART 2: PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

2.02 MATERIALS

- A. Scrim reinforced tarp shall be manufactured from a virgin polyethylene. The tarp shall be produced by laminating two sheets of high strength polyethylene film with a black layer of molten polyethylene. A layer of 900 denier polyester scrim reinforcement laid in a diagonal pattern spaced 3/8 inches apart with an additional machine direction scrim every 3 inches across the width shall be placed between the sheets.
- B. The upside of the tarp shall be white and contain UV inhibitors and thermal stabilizers.
- C. The tarp shall conform to the following minimum properties.

<u>Properties</u>	<u>Minimum Value</u>	<u>Test Method</u>
Thickness	12 mil	ASTM D5199
Weight	55 lbs/MSF	ASTM D751
Grab Tensile	100 lbf	ASTM D7004
Tensile Elongation	17%	ASTM D7004
CBR Puncture Resistance	250 lbs	ASTM D6241

- D. The stormwater tarp shall be Americover Dura-Skrim 12WB or equal.

2.03 QUALITY CONTROL DOCUMENTATION

- A. Prior to installation commencement of any tarp material, the Contractor shall provide to the Owner the following information certified by the manufacturer for the delivered tarp.

1. Each roll or panel delivered to the Project site shall have the following identification information:
 - Manufacturer's name
 - Product identification
 - Thickness
 - Roll or panel number
 - Roll or panel dimensions
2. Quality control certificates, signed by the manufacturer's quality assurance manager. Each certificate shall have roll or panel identification number, sampling procedures, frequency and test results. At a minimum the following test results shall be provided every 100,000 square feet of manufactured tarp in accordance with test requirements specified in Paragraph 2.02.
 - Resin Density
 - Resin Melt Index
 - Thickness
 - Carbon Black Content

2.04 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent Quality Assurance Laboratory (QAL) approved by the Owner and retained by the Contractor. QAT will obtain samples from the delivered material, mark the machine direction and identification number. One sample shall be taken per 100,000 square feet of material, or one sample per lot, whichever results in the greater number of conformance tests. This sampling frequency may be increased as deemed necessary by the CQA Manager. The following conformance tests shall be conducted at the laboratory:
 1. Resin Density (ASTM D1505)
 2. Carbon Black Content (ASTM D1603)
 3. Melt Index (ASTM D1238)
 4. Thickness (ASTM D5199)
 5. Tensile Strength (ASTM D7004)
- B. These conformance tests shall be performed in accordance with test requirements specified in Paragraph 2.02.
- C. All conformance test results shall be reviewed by the CQA Manager and accepted or rejected, prior to the deployment. All test results shall meet, or exceed, the property values listed in Paragraph 2.02. The course of action for failing tests shall be approved by the CQA Manager. In case of failing test results, the Contractor may request that other samples be retested by the QAL with manufacturer's technical representative present during the testing procedures. The costs for retesting including engineering, analyses and all associated expenses shall be paid for by the Contractor. The Contractor may also have the sample retested at two different

laboratories approved by the Owner. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all material from the lot representing the failing sample will be considered out of specification and rejected. The manufacturer may obtain additional samples from rolls or panels immediately before and after the failing roll or panel or as directed by the CQA Manager and have them tested by the QAL at his/her own expense. If these rolls or panels pass, then only the failing roll or panel will be rejected. If they fail, then the entire lot will be rejected.

PART 3: EXECUTION

3.01 PREPARATION

A. General

Prior to installation, the following actions shall occur:

1. The rock protective layer shall be inspected by the Engineer for compliance with the specifications.
2. The Contractor shall confirm all testing and survey information for the protective cover has been obtained.

3.02 INSTALLATION

A. Panel Placement

1. Care shall be taken to keep the tarp clean and free from debris prior to installation.
2. The tarp shall be installed in such a manner as to ensure that it is not damaged in any way. The following procedures shall be complied with during installation:
 - a. In order to protect against wind uplift, all tarp shall be weighted with 50 lb sandbags placed as shown on the Drawings. Such sandbags shall be installed immediately after placement of the tarp.
 - b. Care shall be taken not to leave tools on the tarp.
3. Weather Conditions:
 - a. Tarp installation shall not proceed at an ambient temperature below 40 degrees F or above 104 degrees F unless otherwise authorized, in writing, by the Engineer or his/her field representative.
 - b. Tarp installation shall not be performed during precipitation, excessive moisture, in an area of ponded water, or excessive winds.

B. Method of Placement

1. Each tarp panel shall be laid out in accordance with the approved shop drawings prepared by the Manufacturer. The layout shall be designed to keep field joining to a minimum and consistent with proper methods of installation.
2. The equipment used to deploy the tarp shall not cause excessive rutting of the rock surface. Excessive rutting is defined as more than 6-inches. If rutting occurs, the Contractor shall suspend all tarp placement activities and repair the ruts and immediately employ an alternative method for tarp deployment.
3. The Engineer shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, as approved by the Engineer.
4. Personnel working on the tarp shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the tarp.
5. Vehicular traffic across the tarp shall not be allowed.
6. The tarp shall be kept free of debris, unnecessary tools and materials. In general, the tarp area shall remain uncluttered in appearance.
7. No smoking is allowed on the tarp.

3.03 FIELD SEAMS

- A. Individual panels of tarp or multiple panels that are factory welded shall be laid out and overlapped by a minimum of 4-in prior to seaming. The uphill panel shall be placed over the downhill panel similar to roof shingling in order to limit leakage. The area to be seamed shall be cleaned and prepared in accordance with the installer's quality control seaming procedures.
- B. The seams shall be fusion welded.

3.04 SEAMING WEATHER CONDITIONS

- A. Normal Weather Conditions
 1. The normal required weather conditions for seaming are:
 - a. Ambient temperature higher than 40 degrees F and lower than 104 degrees F.
 - b. No precipitation or other excessive moisture, such as fog or dew.
 - c. No excessive winds.
 2. These weather conditions shall be fulfilled during the seaming process.

3.05 FIELD QUALITY CONTROL

A. Repair Procedures

1. Any portion of the tarp exhibiting signs of damage or defect shall be repaired. Several procedures exist for the repair of these areas. The final decision, as to the appropriate repair procedure, shall be made by the Engineer.
2. The repair procedures available include:
 - a. Patching, used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
 - b. Capping, used to repair large lengths of failed seams.

B. Repair Verification

1. The Contractor shall have all repairs reviewed by the Engineer.

3.06 DISPOSAL OF WASTE MATERIAL

- A Upon completion of installation, the Contractor shall dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

END OF SECTION 02279

SECTION 02505

CRUSHED STONE PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required for new landfill and construction access roads.
- B. The Contractor shall maintain existing roads under this Contract until project final completion. Contractor shall take record photographs of roads to be used by Contractor's construction equipment and activities prior to the start of construction. After completion of construction activities, Contractor to restore access and service roads to original thickness and condition or better than existed prior to Contractor's use during construction.

1.02 RELATED WORK NOT INCLUDED

- A. Section 01410: Testing and Laboratory Services
- B. Section 02200: Excavation, Backfill, and Compaction

1.03 REFERENCE SPECIFICATIONS

- A. Except as otherwise specified herein, the Standard Specifications for Roads and Structures as issued by the State of North Carolina, Department of Transportation, shall apply to material requirements for road construction.

1.04 SUBMITTALS

- A. The Contractor shall submit to the Engineer in accordance with Section 01300 the results of recent gradation and standard Proctor moisture-density test performed by NCDOT on the proposed crushed stone paving material.

PART 2 PRODUCTS

2.01 SUBGRADE MATERIAL

- A. Subgrade in cut areas shall consist of firm, hard natural soils and shall be proofrolled as described in Section 3.02. Subgrade in fill areas shall consist of Select Fill, as defined in Section 02200 and compacted to at least 100 percent of its standard Proctor (ASTM D698) maximum dry density.

2.02 CRUSHED STONE

- A. Crushed Stone paving material shall conform to NCDOT standards Section 1005, Table 1005-1 for ABC stone and shall be compacted to at least 100 percent of its standard Proctor (ASTM D698) maximum dry density at a minimum frequency of one per every 50 feet of roadway. More frequent testing may be required during initial placement to confirm means and methods are resulting in the desired compaction.

PART 3 EXECUTION

3.01 GENERAL

- A. Materials for the access road shall be delivered, placed and compacted in accordance with the contract specifications and drawings.
- B. The Contractor shall perform all general unclassified excavation, rough or overall grading, borrow and fill, to the subgrades of the road, road shoulders and slopes to match the existing grades.
- C. Finished excavation and grading shall be uniformly smooth, well compacted, and free from irregular surface changes. The degree of finish shall be that obtainable from either blade-grader or scraper operations. The finished surface shall not be more than 0.10 ft above or below the original design grade.

3.02 INSTALLATION

- A. Prior to placing Select Fill in fill areas, or Crushed Stone paving in cut areas, the exposed natural soil subgrade shall be proofrolled. Proofrolling shall be performed with at least four complete coverages of the rear wheels of a fully-loaded CAT D300D truck or equivalent or as directed by the Engineer. Soft, wet, organic, or other unsuitable materials or conditions identified during proofrolling shall be undercut by at least 12 inches and backfilled with Select Fill as directed by the Engineer.
- B. Select Fill shall be placed in layers in accordance with Section 02200 and compacted to at least 100 percent of its standard Proctor (ASTM D698) maximum dry density.
- C. Place geotextile at base of crushed stone paving if subgrade is exposed as part of repair/replacement work.
- D. Crushed Stone Paving shall be placed over the prepared subgrade where shown on the Contract Documents. Each lift of Crushed Stone shall be compacted to at least 100% of its standard Proctor (ASTM D698) maximum dry density. Lifts will be no more than 6 inches thick.

END OF SECTION 02505

SECTION 02576

ASPHALT PAVING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, material, equipment and incidentals required to provide new asphalt pavement where shown on the Drawings.
- B. New pavement shall consist of binder course and surface course, as specified and indicated, for the full width pavement over the existing traveled way.
- C. Streets, driveways, parking areas or sidewalk pavements damaged or disturbed by the Contractor's operations shall be repaired, replaced or restored in accordance with the requirements specified herein and as directed for the respective type of pavement replacement and in a manner satisfactory to the Owner.

1.02 SUBMITTALS

- A. Submit, in accordance with Section 01300, the following:
 - 1. Certified Mix Designs and laboratory testing conforming to the NCDOT Standard Specifications.
- B. Submittals are to be made prior to starting the paving work.

1.03 REFERENCE STANDARDS

- A. Except as otherwise specified herein, the most current North Carolina Department of Transportation Standard Specifications for Roads and Structures including all addenda, shall apply to materials and workmanship required for the work of this Section.
- B. American Association of State Highways and Transportation Officials (AASHTO)
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

- A. Conform to NCDOT Standard Specifications for testing of asphalt pavement.
- B. Engineer to retain the services of an independent testing laboratory to perform required testing.

- C. Perform in-place density tests on binder and surface course at a frequency of one test every 500 lineal feet as measured along the centerline.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Binder Course shall conform to asphalt NCDOT I19.OB.
- B. Surface Course shall conform to asphalt NCDOT SC9.5B.

PART 3 EXECUTION

3.01 GENERAL

- A. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with the NCDOT Standard Specifications.
- B. When the air temperature falls below 50 degrees F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.
- C. No mixtures shall be placed when the air temperature is below 40 degrees F, nor when the material on which the mixtures are to be placed contains frost or has a surface temperature not suitable to the Engineer.
- D. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.

3.02 NEW PAVING

- A. The binder course shall be placed as soon as possible after the crushed stone base has been prepared, fine graded, and proofrolled.
- B. The binder course shall be placed and compacted by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete. Where necessary, the new pavement shall be rolled smooth and even with the existing pavement.
- C. Maintain pavement under this Contract during the guarantee period of 1 year and promptly within 3 days of notice given by Engineer or Owner refill and repave areas which have settled or are otherwise unsatisfactory for traffic.
- D. All pavement thicknesses referred to herein are compacted thicknesses. Place sufficient mix to ensure that the specified thickness of pavement occurs wherever called for.

- E. After the paving mixture has been properly spread, initial compaction shall be obtained by the use of power rollers weighing not less than 240 lbs/in width of tread.
- F. Final compaction of the surface shall be accomplished by rollers weighing not less than 285 lbs/in width of tread. Along curbs, structures and all places not accessible with a roller, the mixture shall be thoroughly compacted with tampers. Such tampers shall not weigh less than 25 lbs and shall have a tamping face of not more than 50 sq in. The surface of the mixture after compaction shall be smooth and true to the established line and grade.

3.04 INSTALLATION

- A. Final pavement over the entire traveled way shall be constructed as follows:
 - 1. Repair all soft and broken areas in temporary and existing pavement. Clean all surfaces to be paved of all foreign matter and loose material. All surfaces shall be dry before priming.
 - 2. Apply prime coat to existing and initial pavement as specified in NCDOT Standard Specifications.
 - 3. Spread and compact Binder Course to 4-inch thickness over crushed stone to the entire width of the traveled way. Asphalt shall be placed by mechanical spreader except in areas inaccessible to the spreader.
 - 4. Spread and compact surface course to 2.5-inch thickness over binder course by mechanical spreader except in areas inaccessible to the spreader.
 - 5. Where new pavement meets existing asphalt concrete pavement, grade back existing crushed stone and sawcut existing asphalt pavement as indicated on the drawings, to match pavement sections.
 - 6. Clean all pavement and remove all loose aggregate from the site.

END OF SECTION 02576

SECTION 02605

PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment required to install precast concrete structures, inlets, frames and covers, access hatches, and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

Related work includes, but is not limited to, the following:

- A. Section 02200: Excavation, Backfill and Compaction

1.03 SUBMITTALS

- A. Shop drawings, product data, materials of construction, and details of installation shall be submitted in accordance with Section 01300. Submittals shall include the following:
 - 1. Base sections, riser sections, eccentric and concentric conical top sections, flat slab tops, and grade rings with notarized certificate indicating compliance with ASTM C478.
 - 2. Pipe connections.
 - 3. Frame and cover with notarized certificate indicating compliance with ASTM A48, Class 30.
 - 4. Method of repair for minor damage to precast concrete sections.
 - 5. Building brick with notarized certificate indicating compliance with ASTM C62.
 - 6. Layout drawings of all pipe trenches which shall include component part outline dimensions, location of each part in the system, intended loading (pedestrian or H-20), the number, identification, and location of each pipe within trenches, and a complete bill of material.
- B. Design Data
 - 1. Precast concrete structures:
 - a. Sectional plan(s) and elevations showing dimensions and reinforcing steel placement.
 - b. Structural calculations including assumptions.

- c. Concrete design mix.

C. Test Reports

- 1. Precast concrete structures:
 - a. Concrete test cylinder reports from an approved testing laboratory certifying conformance with specifications.

1.04 REFERENCE STANDARDS

Reference standards include, but are not limited to, the following:

A. American Society for Testing and Materials (ASTM)

- 1. ASTM A48 - Specification for Gray Iron Castings
- 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- 3. ASTM C32 - Specification for Sewer and Manhole Brick (Made from Clay or Shale)
- 4. ASTM C33 - Specification for Concrete Aggregates
- 5. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale)
- 6. ASTM C150 - Standard Specification for Portland Cement
- 7. ASTM C207 - Specification for Hydrated Lime for Masonry Purposes
- 8. ASTM C443 - Standard Specification for Joints for Concrete Pipes and Manholes, Using Rubber Gaskets
- 9. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
- 10. ASTM D4101 - Specification for Propylene Plastic Injection and Extrusion Materials

B. American Concrete Institute (ACI)

- 1. ACI 318 - Building Code Requirements for Reinforced Concrete
- 2. ACI 350R - Concrete Sanitary Engineering Structures

C. Occupational Safety and Health Administration (OSHA)

- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All material shall be new and unused.
- B. Materials' quality, manufacturing process and finished sections are subject to inspection and approval by Engineer or other Owner representative. Inspection may be made at place of manufacture, at work site following delivery, or both.
- C. Materials will be examined for compliance with ASTM or other applicable industry specifications, these Specifications and approved manufacturer's drawings. Additional inspection criteria shall include: appearance, dimensions(s), blisters, cracks and soundness.
- D. Materials shall be rejected for failure to meet any Specification requirement. Rejection may occur at place of manufacture, at work site, or following installation. Mark for identification rejected materials and remove from work site immediately. Rejected materials shall be replaced at no cost to Owner.
- E. Repair minor damage to precast concrete sections by approved method, if repair is authorized by Engineer.

PART 2 PRODUCTS

2.01 GENERAL

- A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.
- C. Provide lifting lugs or holes in each precast section for proper handling.

2.02 PRECAST CONCRETE DROP INLETS

- A. Precast concrete base sections, riser sections, transition top sections, and flat slab tops shall conform to ASTM C478 and meet the following requirements:
 - 1. Bottom slab thickness shall equal the wall thickness or flat slab top thickness, whichever is greater.
 - 2. All sections shall have tongue and groove joints.
 - 3. All sections shall be cured by an approved method.

4. Precast concrete sections shall be shipped after concrete has attained 3,000 psi compressive strength.
5. Mark date of manufacture, name and trademark of manufacturer on the inside of each precast section.
6. Provide integrally cast knock-out panels in precast concrete drop inlets at the locations and with the sizes shown on the Drawings. Knock-out panels shall have no steel reinforcing.

2.03 PRECAST CONCRETE STRUCTURES

- A. Precast reinforced concrete structures shall be manufactured by Tindall, Oldcastle Infrastructure, or approved equal. Refer to Drawings for inside dimensions, headroom requirements and minimum thickness of concrete.
- B. Manufacturer shall notify Engineer at least five working days prior to placing concrete during manufacturing process. Engineer may inspect reinforcing steel placement prior to placing concrete.
- C. Structural design calculations and Drawings shall be prepared and stamped by a Professional Engineer registered in North Carolina.
- D. Design Criteria
 1. Precast concrete
 - a. Minimum compressive strength shall be 5,000 psi at 28 days.
 - b. Maximum water content shall be six gallons per 94 pound sack of cement.
 - c. Minimum cement content shall be six 94 pound sacks of cement per cubic yard of concrete.
 2. Manufactured products
 - a. Conform to ACI 318 and ACI 350R.
 - b. Analyze walls and slabs using accepted engineering principals.
 - c. When "fy" exceeds 40,000 psi, "z" (ACI 318) shall not exceed 95,000 psi. "fs" shall not exceed 50 percent of "fy".
 - d. Design products to support their own weight, weight of soil at 130 pcf, and a live load equal to AASHTO HS-20 or 300 psf, whichever is applicable, applied to top slab.
 - e. Cast base slab and walls together to form a monolithic base section.

- f. Design structure walls for a water pressure of 90 psf. Originate pressure diagram at finished ground surface. Include lateral pressure from vehicles in accordance with AASHTO.
- g. Consider discontinuities in structure produced by openings and joints. Provide additional reinforcing around openings. Frame openings to carry full design loads to support walls.
- h. Prevent flotation, with ground water level at finished ground surface, by dead weight of structure and soil load above structure. Do not consider skin friction, soil friction, or weight of equipment in structure.
- i. Locate horizontal wall joints 18-in. minimum from horizontal centerline of wall openings.
- j. Design structure with a minimum number of joints. Maximum number of structure sections, including top slab, shall be four.
- k. Provide lifting hooks for top slab.
- l. Locate access openings, wall sleeves and pipe penetrations as shown on Drawings.
- m. Wall sleeves shall be provided to the precast concrete manufacturer.

2.04 BRICK MASONRY

- A. Bricks shall be sound, hard, uniformly burned, regular and uniform in shape and size. Underburned or salmon brick shall not be acceptable. Only whole brick shall be used.
 - 1. Bricks for channels and shelves shall conform to ASTM C32, Grade SS except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick shall exceed 11 percent.
 - 2. Bricks for raising manhole frames to finished grade shall conform to ASTM C62.
- B. Mortar shall be composed of one part portland cement, two parts sand, and hydrated lime not to exceed 10 lbs to each bag of cement. Portland cement shall be ASTM C150, Type II; hydrated lime shall conform to ASTM C207.
- C. Sand shall be washed, cleaned, screened, well graded with all particles passing a No. 4 sieve and conform to ASTM C33.

2.05 JOINTING PRECAST SECTIONS

- A. Seal tongue and groove joints of precast structure sections with either rubber "O"-ring gasket or preformed flexible joint sealant. "O"-ring gasket shall conform to ASTM C443. Preformed flexible joint sealant shall be Kent Seal No. 2 as manufactured by Hamilton-Kent; Ram-Nek as manufactured by Henry Company or equal.

- B. Completed joint shall withstand 15 psi internal water pressure without leakage or displacement of gasket or sealant.

2.06 RUNGS

- A. Rungs shall be either of the following types:
 - 1. Cast aluminum alloy 6061-T6, drop front design, 16-in wide with an abrasive step surface conforming to OSHA requirements.
 - 2. Steel reinforced, copolymer polypropylene, 14-in wide, M.A. Industries Inc, PF Series or equal. Copolymer polypropylene shall conform to ASTM D4101 Classification PP200 B33450 Z02. Steel reinforcing shall be 1/2-in diameter, conforming to ASTM A615, Grade 60 and shall be continuous throughout rung.

2.07 ALUMINUM HATCHES

- A. See drawings for requirements. Hatches shall be designed for AASHTO H20 loading in all roadways, parking lots, or areas subjected to vehicular traffic, and a live load of 300 lbs per sq ft in all other locations. Heavy-duty stainless steel hardware shall be used throughout the fabrication. Doors shall be equipped with heavy-duty stainless steel hinges, stainless steel pins, spring operators and automatic hold open arm having a vinyl covered release handle. Hinges shall be through-bolted to the cover and frame with tamperproof stainless steel lock bolts and stainless steel bolt and lock nut, respectively.

2.08 PIPE CONNECTIONS TO CONCRETE STRUCTURES

- A. Connect pipe to precast concrete structures in the following ways:
 - 1. Grout in place - Precast structures shall have a formed, tapered circular opening larger than the pipe outside diameter. Grout shall be non-shrink and waterproof equal to Waterplug or Embeco. Plastic pipe shall have a waterstop gasket secured to pipe with a stainless steel clamp.
 - 2. Flexible sleeve - Integrally cast sleeve in precast concrete sections (new structures) or install sleeve in a formed or cored opening (modifications to existing structures only). Fasten pipe in sleeve with stainless steel clamp(s). Coat stainless steel clamp(s) with bituminous material to protect from corrosion. Flexible sleeve shall be Lock Joint Flexible Manhole Sleeve; Kor-N-Seal connector; PSX Press-Seal Gasket or equal.
 - 3. Compression gasket - Integrally cast compression gasket in precast manhole section. Insert pipe into compression gasket.

PART 3 EXECUTION

3.01 INSTALLATION

A. Drop Inlet Installation

1. Drop inlets shall be constructed to the dimensions shown on the Drawings and as specified in these Specifications. Protect all work against flooding and flotation.
2. Place base on a bed of screened gravel as shown on the Drawings. Set base grade so that a maximum grade adjustment of 8-in is required to bring the frame and cover to final grade. Use precast concrete grade rings or brick and non-shrink mortar to adjust frame and cover to final grade.
3. Set precast concrete barrel sections and drop inlet structures plumb with a 1/4 -in maximum out of plumb tolerance allowed. Seal joints of precast sections with either a rubber "o" ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking section joint with lead wool or non-shrink grout to the satisfaction of the Engineer.
4. Allow joints to set for 14 hours before backfilling unless a shorter period is specifically approved by the Engineer.
5. Plug holes in the concrete barrel sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
6. Cut holes in precast sections to accommodate pipes prior to setting sections in place to prevent jarring which may loosen the mortar joints.
7. Backfill carefully and evenly around each section.

B. Precast Concrete Structure

1. Structures shall be constructed to the dimensions shown on the Drawings and as specified in these Specifications. Protect all work against flooding and flotation. Construct cast-in-place bases in accordance with the requirements of Division 3 and the details shown on the Drawings.
2. Place base on a bed of screened gravel or as shown on the Drawings. Set base grade so that a maximum grade adjustment of +8-in is required to bring the frame and cover to final grade.

Use precast concrete grade rings or brick and non-shrink mortar to adjust frame and cover to final grade.
3. Set precast concrete structures plumb with a 1/4-in maximum out of plumb tolerance allowed. Seal joints of precast sections with either a rubber "O" ring set in a recess or preformed flexible joint sealant in sufficient quantity to fill 75 percent of the joint cavity. Fill the outside and inside joint with non-shrink mortar and finished flush with the adjoining surfaces. Caulk the inside of any leaking section joint with lead wool or non-shrink grout to the satisfaction of the Engineer.

4. Allow joints to set for 14 hours before backfilling unless a shorter period is specifically approved by the Engineer.
5. Plug holes in the concrete barrel sections required for handling with a non-shrinking grout or non-shrinking grout in combination with concrete plugs. Finish flush on the inside.
6. Cut holes in precast sections to accommodate pipes prior to setting sections in place to prevent jarring which may loosen the mortar joints. Holes will not be allowed to be cut in new precast structures unless specifically noted in the drawings or previously authorized by the Engineer.
7. Backfill carefully and evenly around each section.

C. Pipe Connections

1. Construct pipe connections, including pipe stubs, as specified above. Close or seal pipe stubs for future connections with a gasketed watertight plug.

D. Rung Installation

1. Aluminum Rungs

- a. Grout aluminum rungs into precast sections, on 12-in centers. Pre-form holes in sections for rungs during casting. Holes for rungs shall be 1-1/8-inch in diameter and a minimum of 3-1/2-in deep.
- b. Grout rungs into precast sections immediately after casting and placing in the curing area, or immediately after coring holes for manhole rungs into base section. Fill holes with grout consisting of Portland Type II cement and mortar sand in a 1 to 1/2 ratio mixed to a putty consistency.
- c. Paint those parts of the rungs that are embedded with a heavy coating of zinc chromate or other approved paint.

2. Steel Reinforced Polypropylene Plastic Rungs

- a. Pre-form holes for rungs during casting of the riser and cone sections, using tapered form pins specifically made for pre-forming rung holes.
- b. Drive rungs into pre-formed holes after concrete has developed a compressive strength of 3,000 psi.
- c. Alternatively, cast rungs into riser and cone sections when concrete is placed.
- d. Drilling holes for rungs may be used to accommodate field conditions when approved by the Engineer. Drill holes of diameter, spacing and depth required by rung manufacturer.

3. Pull-out resistance test

- a. All rung installation methods shall withstand a pull-out resistance test of 1,500 pounds.

E. Setting Frame and Cover

1. Set covers and frames in a full mortar bed. Utilize bricks or precast concrete grade rings, a maximum of 8-in thick, to assure frame and cover are set to the finished grade. Set frame and cover to final grade prior to placement of permanent paving.

F. Aluminum Hatch Installation

1. Where aluminum contacts a dissimilar metal, apply a protective paint to the aluminum and to the dissimilar metal.
2. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.
3. Where items are cast into concrete, backpaint contact areas before setting.

3.02 LEAKAGE TESTS

- A. Test each structure for leakage. Engineer shall observe each test. Perform exfiltration test as described below.
- B. Assemble each structure in place; fill and point all lifting holes and exterior joints within six feet of the ground surface with an approved non-shrinking mortar. Test prior to placing the shelf and invert and before filling and pointing the horizontal joints below 6-ft of depth. Lower ground water table below bottom of the structure for the duration of the test. Plug all pipes and other openings into the structure and brace to prevent blow out.
- C. Fill the structure with water to the top. If the excavation has not been backfilled and no water is observed moving down the surface of the structure, then it is satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the structure excavation has been backfilled, continue the test. A period of time may be permitted to allow for absorption. Following this period, refill to the top, if necessary, and allow at least eight hours to pass. At the end of the test period, refill to the top again, measuring the volume of water added. Extrapolate the refill amount to a 24-hour leakage rate. The leakage for each structure shall not exceed one gallon per vertical foot for a 24-hour period. If the structure fails this requirement, but the leakage does not exceed three gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer. If leakage due to a defective section of joint exceeds three gallons per vertical foot per day, the structure shall be rejected. Uncover the rejected structure as necessary to disassemble, reconstruct or replace it as directed by the Engineer. Retest the structure and, if satisfactory, fill and paint the interior joints.

- D. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.

3.03 CLEANING

- A. Thoroughly clean all new structures of all silt, debris and foreign matter of any kind, prior to final inspections.

END OF SECTION 02605

SECTION 02612

REINFORCED CONCRETE PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, equipment, materials and incidentals necessary to install and test reinforced concrete pipe and fittings for the pump station inlet as shown on the Drawings and as specified herein.
- B. All pipes shall be manufactured for this project and no pipe shall be furnished from stock.
- C. This work shall include, but not be limited to installing reinforced concrete pipe including all excavation, backfilling, sheeting, slope protection, drainage, concrete work, riprap, grading and all other work necessary to complete the construction, installation and testing of the reinforced concrete pipe.

1.02 RELATED WORK

Related work includes, but is not limited to, the following:

- A. Section 02200: Excavation, backfill and grading

1.03 QUALIFICATIONS

- A. All reinforced concrete pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable and qualified to manufacture the pipe to be furnished.
- B. Reinforced concrete pipe and fittings shall conform to all applicable ASTM Standards and these specifications.

1.04 SUBMITTALS

- A. Submit to the Engineer within 15 days after receipt of Notice to Proceed, a list of materials to be furnished, the names of the suppliers, and the date of delivery of materials to the site.
- B. The pipe manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish to the Engineer a notarized affidavit stating all pipe meets the requirements of ASTM, ASCE, ANSI, AWWA, etc., these Specifications, and the joint design with respect to square ends and out-of-round joint surfaces.
- C. Furnish in duplicate to the Engineer sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.

1.05 INSPECTION

All pipe and fittings to be installed under this contract may be inspected at the site of manufacture for compliance with these Specifications by an independent laboratory selected by the Owner. The manufacturer's cooperation shall be required in these inspections. The cost of inspection by an independent laboratory, will be borne by the Owner.

PART 2 PRODUCTS

2.01 REINFORCED CONCRETE PIPE

- A. Except as otherwise specified herein or as indicated on the Drawings, pipe shall conform to ASTM C76, Standard Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe. Pipe shall be Class IV Wall B. Reinforcement shall be full circular cage. Neither elliptical nor quadrant reinforcement will be allowed.
- B. The pipe shall be capable of withstanding construction equipment loading which may be encountered during the progress of the work. Any pipe damage during construction operations shall be promptly and satisfactorily repaired or replaced at the Contractor's expense.
- C. Non-air-entraining portland cement conforming to ASTM Specification C150, Type II shall be used, except as otherwise approved in writing by the Engineer. The use of any other admixture will not be permitted.
- D. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specifications C33, except for gradation, with a maximum loss of 8 percent when subjected to five cycles of the soundness test using magnesium sulfate.
- E. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C33, except for gradation, with a maximum loss of 8.0 percent when subjected to five cycles of the soundness test using magnesium sulfate.
- F. The 28-day compressive strength of the concrete shall be not less than 4,000 psi. The pipe interior shall comprise a continuous integral cement skin and shall be smooth and even, free from roughness, projections, indentations, offsets or irregularities. The concrete mass shall be dense and uniform. The average absorption for the pipe shall not exceed 5.0 percent of the dry weight and no specimen shall exceed 9.0 percent. Reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling and installation.
- G. The pipe shall be clearly marked as required by ASTM C76 in a manner acceptable to the Engineer. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until the compressive strength of the concrete has attained 3,000 psi and not before five (5) days after manufacture, and/or repair, whichever is the longer.
- H. Piping shall have a minimum laying length of approximately 8 feet, except for closure and other special pieces as approved by the Engineer. The length of the concrete pipe at each structure shall be as shown but in any case, shall not exceed 3 feet.

- I. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. All pipe which has been damaged after delivery will be rejected. If damaged pipe already has been laid in the trench it shall be acceptably repaired or removed and replaced at the sole discretion of the Engineer entirely at the Contractor's expense. Pipe may be rejected for any of the following reasons:
1. Exposure of any wires and positioning spacers or chairs used to hold the reinforcement cage in position, or steel reinforcement in any surface of pipe, except for ends of longitudinal reinforcing. Type 304 stainless steel chairs and spacers may be used in lieu of this requirement.
 2. Transverse reinforcing steel found to be in excess of 1/4-inch out of specified position after the pipe is molded.
 3. Any shattering or flaking of concrete at a crack.
 4. Air bubble voids (bugholes) on the interior and exterior surfaces of the pipe exceeding 1/4-inch in depth unless properly and soundly filled with mortar or other approved material.
 5. Unauthorized application of any wash coat of cement or grout.
 6. A hollow spot (identified by tapping the internal surface of the pipe) which is greater than 3 inches in length or wider than 3 times the specified wall thickness. Repair of such defective areas not exceeding these limitations may be made.
 7. Defects that indicate imperfect molding of concrete; or any surface defect indicating honeycomb or open texture (rock pockets) greater in size than an area equal to a square with a side dimension of 2-1/2 times the wall thickness or deeper than two times the maximum graded aggregate size or local deficiency of cement resulting in loosely bonded concrete, the area of which exceeds in size the limits or area described in Paragraph 6 above, when the defective concrete is removed. Repair of such defects not exceeding these limits may be made as provided in Paragraph 6 above.
 8. Any of the following cracks:
 - a. A crack having a width of 0.005 inch to 0.01 inch throughout a continuous length of 36 inches or more.
 - b. A crack having a width of 0.01 inch to 0.03 inches or more throughout a continuous length of 1 foot or more.
 - c. Any crack greater than 0.005 inch extending through the wall of the pipe and having a length in excess of the wall thickness.
 - d. Any crack showing two visible lines of separation for a continuous length of 2 feet or more, or an interrupted length of 3 feet or more anywhere in evidence, both inside and outside.
 - e. Cracks anywhere greater than 0.03 inch in width.

9. Transverse reinforcing steel found to be in excess of 1/4-inch out of specified position after the pipe is molded.
 10. A deficiency greater than 1/4-inch from the specified wall thickness of pipe 30 inches or smaller in internal diameter.
 11. A deficiency greater than 6 percent from the specified wall thickness of pipe larger than 30 inches in internal diameter, except that the deficiency may be 8 percent adjacent to the longitudinal form joint, provided that the additional deficiency does not lie closer than 20 percent of the internal diameter of the pipe. The deficiencies in wall thickness permitted herein do not apply to gasket contact surfaces in gasketed joint pipe.
 12. A variation from the specified internal diameter in excess of 1 percent, or interior surfaces which have been reworked after placing of concrete. The variation in internal diameter permitted herein does not apply to gasket contact surface in gasketed joint pipe.
- J. Pits, blisters, rough spots, breakage, and other imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days, when tested in 3-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.
- K. Joints for concrete pipe less than 48 inches in diameter shall be the tongue and groove or bell and spigot type of joint with provisions for using a round rubber "O-Ring" gasket in a recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2 degree and 2-1/2 degree and the annular open space at the gasket when the joint is made up and pipes are centered and in line shall not exceed 3/16-inch. The diameters of the joint surfaces which compress the gasket shall not vary from the true diameters by more than 1/16-inch. The faces of pipe in contact with the gasket shall be true, and free of irregularities.
1. The round rubber "O-Ring" gaskets shall conform to ASTM C443 Specifications for Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gaskets.
 2. The manufacturer shall supply test data and affidavits showing compliance with these requirements. Tests shall have been conducted within six months of the start of manufacture of the pipe.
 3. The pipe manufacturer shall furnish information and supervise the installation of at least the first five joints installed by the Contractor. The ends of the pipe shall be made true to form and dimension by casting against steel forms.
- L. Reinforced concrete bends shall be cast to the degree of curvature required or fabricated by cutting the pipe at the required angle and then rejoining the sections. Bends may be smooth or mitered providing mitered angles do not exceed 22-1/2 degrees and bends have a radius divided by the pipe diameter greater or equal to one.

- M. Joints for concrete pipe 48 inches in diameter and larger shall be of the rubber and steel joint design utilizing a steel bell, a steel spigot, a round rubber gasket and meeting the requirements of ANSI/AWWA C301. Steel skirts shall be welded to the spigot ring and adequately welded to internal reinforcing. The steel in the bells shall be adequate to resist cracking the concrete during installation. Before the first pipe is shipped, the manufacturer shall make a fit-up test in the presence of the Engineer.

PART 3 EXECUTION

3.01 GENERAL

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer.
- B. All pipe and fittings shall be subjected to a careful inspection and hammer test just prior to being laid or installed. If any defective pipe is discovered after it has been laid it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.
- C. All buried piping shall be installed to the lines and grades as shown on the Drawings. All underground piping shall slope uniformly between joints where elevations are shown.
- D. Bevel and short pipe shall be used as necessary to meet site conditions and to provide a pipe installation as shown in the Drawings. The cost of all such pipe shall be included within the bid price for the pipe.

3.02 REINFORCED CONCRETE PIPE

- A. As soon as the excavation is completed to the normal grade required, the Contractor shall immediately place screened gravel bedding material in the trench, and then the pipe shall be firmly bedded in this gravel to conform accurately to the lines and grades indicated on the Drawings. Bedding material for bedding the pipe shall conform to the specifications under Section 02200.
- B. Bedding material, as specified, shall be placed and compacted to give complete vertical and lateral support for the lower section of the pipe. A depression shall be left in the bedding material at the joint to prevent bedding material from entering the bell and interfering with seating the spigot or contaminating the gasket. Before the pipe is lowered into the trench, the spigot and bell shall be clean and free from dirt. As soon as the spigot is centered in the bell of the previously laid pipe, it shall be forced home smoothly and evenly with a pipe jack or other similar equipment. The pipe jack shall be anchored sufficiently so that the pulling force will not dislodge the pieces of the pipe already in place. If necessary, the Contractor shall employ hand methods of pipe joining. For example, the pipe may be forced home by using come-alongs or by the proper manipulation of a backbone and cable sling. The Contractor shall be responsible for any

damage to pipe ends due to improper pipe homing techniques and shall promptly repair or replace any pipe so damaged at no cost to the Owner.

- C. The gasket and bell shall be lubricated by a vegetable lubricant, which is not soluble in water, furnished by the pipe manufacturer and harmless to the rubber gasket. Each gasket shall be carefully checked for proper positioning around the full circumference of the joint. Special measures shall be taken to ensure that the gaskets are properly positioned. For example, steel inserts may be required to prevent the pipe from going home until a feeler gauge is used to check the final position of the gasket, with special attention being given to the bottom half of the pipe.
- D. As soon as the pipe is in place and before the jack, come-along or sling is released, backfill shall be placed and compacted to the mid-diameter point for at least one-half the length of the pipe. Not until this backfill is placed shall the jack, come-along or sling be released. If motion at any joint is detected, more compacted backfill shall be placed before pressure is released.
- E. Following full joint insertion, the space outside of the gasket shall be immediately filled with grout, followed by full joint grouting in accordance with the pipe manufacturer's recommendations.
- F. A cloth joint band or diaper held with wires shall be placed to cover the outside joint and prevent the entrance of dirt. Grout composed of one part cement to two parts of well-graded mason's sand shall be poured into the outside joint on one side of the pipe to at least the springline. Placing mortar with hand tools may be done with the upper half of the joint. Grout must fill the entire joint. All exposed metal surfaces of appurtenances shall be covered with a minimum of 3/4-inch of cement grout all around.
- G. The Contractor shall have the option of using a joint filler approved by the Engineer in place of the diaper-grout operation, except for restrained joints.

3.03 STRUCTURE AND MANHOLE CONNECTIONS

Pipe stubs for all structure and manhole connections shall not exceed 2 feet in length.

3.04 TESTING

Test installed pipe in accordance with ASTM C969, Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines, in the presence of the Engineer.

3.05 CLEANING

- A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Engineer will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired.

END OF SECTION 02612

SECTION 02623

HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install high density polyethylene (HDPE) pipe, fittings and appurtenances as shown on the Drawings and as specified herein.

1.02 RELATED WORK

Related work includes, but is not limited to, the following:

- A. Section 02200: Excavation, Backfill, and Compaction
- B. Section 02700: Protective Cover Aggregate
- C. Section 02776: High Density Polyethylene (HDPE) Geomembrane

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, and within 30 days following the Effective Date of the Agreement, the following:
 - 1. List of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
 - 2. The origin of the resin to be used in the manufacturing of the pipe including the suppliers name and production plant, as well as brand name and number.
 - 3. Documentation from the resin's manufacturer showing results of the following tests for resin identification:
 - a. Melt Flow Index ASTM D1238
 - b. Density ASTM D1505
 - 4. Manufacturer quality control manual describing implementation of quality control procedures during pipe manufacturing process.
 - 5. Pipe manufacturer's certification of compliance with these Specifications.
 - 6. Complete, detailed shop drawings of all polyethylene pipe, including the location of all fittings, joints and connections to structures.

7. Manufacturer's recommendations for handling, storing and installing pipe and fittings.
8. For each shipment of pipe, a manufacturer's certification that the pipe was manufactured from the same resin identified above.
9. Certification demonstrating that the joining technician was trained by the pipe manufacturer and is qualified to perform heat fusion welding.
10. Cleaning and video inspection contractor qualifications for the new and existing leachate piping that comply with Paragraph 3.03.

1.04 REFERENCE STANDARDS

Referenced standards include, but are not limited to, the following:

A. American Society for Testing and Materials (ASTM)

1. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
2. ASTM D1505 - Standard Test Method for Density of Plastic by the Density Gradient Technique.
3. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
4. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
5. ASTM D3350 - Specification for Polyethylene Plastic Pipe and Fitting Materials.
6. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

B. Plastic Pipe Institute (PPI)

1. Handbook of Polyethylene Pipe

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Resin Evaluation

1. All incoming resin shall be sampled for conformance testing against test results supplied by the resin manufacturer. Samples shall be taken from the top and bottom of each compartment from every hopper car received. The following conformance tests shall be performed on the sample:

- a. Melt Flow Index ASTM D1238
- b. Density ASTM D1505
- c. The results of these tests shall become part of the manufacturer's permanent quality control records.

B. Finished Product Evaluation

- 1. Each length of pipe produced shall be checked by production staff for the items listed below. The results of all measurements shall be recorded on production sheets which become part of the manufacturer's permanent records.
 - a. Pipe in process shall be checked visually, inside and out for cosmetic defects (grooves, pits, hollows, etc).
 - b. Pipe outside diameter shall be measured using a suitable periphery tape to ensure conformance with ASTM F714.
 - c. Pipe wall thickness shall be measured at 12 equally spaced locations around the circumference at both ends of the pipe to ensure conformance with ASTM F714.
 - d. Pipe length shall be measured.
 - e. Pipe marking shall be examined and checked for accuracy.
 - f. Pipe ends shall be checked to ensure they are cut square and clean.
 - g. Subject inside surface to a "reverse bend test" to ensure the pipe is free of oxidation (brittleness).

C. Stress Regression Testing

- 1. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific polyethylene resin being utilized in the manufacture of this product. This stress regression testing shall have been done in accordance with ASTM D2837 and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 1,600 psi as determined in accordance with ASTM D2837.

1.06 SYSTEM DESCRIPTION

- A. The high-density polyethylene pipe specified herein shall be suitable for landfill conditions.

PART 2 PRODUCT

2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. The pipes and fittings shall be Performance Pipe DriscoPlex 4100 series, Polypipe, or equal. All material shall be manufactured from a PE4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350 with a minimum cell classification of PE445574C.
- B. HDPE pipe shall be Standard Dimension Ratio SDR17 unless otherwise noted on the drawings.
- C. The pipes shall have the nominal dimensions shown on the Drawings
- D. All polyethylene pipe shall meet the requirements of ASTM F714.
- E. The pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations.
- F. Pipe shall be furnished in standard laying lengths not exceeding 50 feet.
- G. All high-density polyethylene pipe and fittings shall be made from the same resin.

2.02 PIPE IDENTIFICATION

- A. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5-ft per ASTM F714:
 - 1. Manufacturing standard reference, e.g., ASTM F714.
 - 2. Name and/or trademark of the pipe manufacturer.
 - 3. The letters PE followed by the polyethylene grade in accordance with ASTM D3350, e.g., PE445574C. Where applicable, the standard thermoplastic pipe materials designation code may be used as an alternative marking, eg. PE4710.
 - 4. Nominal pipe size
 - 5. Dimension ratio
 - 6. A production code from which the date and place of manufacture can be determined.
 - 7. The Leachate Forcemain shall have a yellow 1-inch thick stripe along the length of the pipe at 0, 90, 180, and 270 degrees on the cross-section of the pipe.
 - 8. The Leachate Recirculation Forcemain shall have a green 1-inch thick stripe along the length of the pipe at 0, 90, 180, and 270 degrees on the cross-section of the pipe

2.03 PERFORATIONS

- A. The leachate collection pipes, as shown on the Drawings, shall be perforated. The perforations shall be drilled into the pipe at the factory after manufacturing, as shown on the Drawings.
- B. The perforations shall be covered with tape compatible to the pipe material upon delivery to prevent soil material from entering the pipe prior to installation.

2.04 HEAT TRACING AND INSULATION

- A. Electrical heat tap and insulation shall be installed as shown on the Drawings. Heat tape shall be EasyHeat Freeze Self Regulating Pipe Heating System by EasyHeat. Heat tape shall be installed per the Manufacturer's guidelines. Insulation thickness shall be as recommended by the Manufacturer for a temperature of -20°F. Insulation of interior piping shall be jacketed with suitable moisture resistant fabric type material. Insulation of exterior piping shall have an aluminum or plastic jacketing.

PART 3 EXECUTION

3.01 INSTALLATION

- A. HDPE Pipe shall be installed in accordance with the instruction of the manufacturer, as shown on the Drawings and as specified herein. All heat fusion joints shall be done by a factory qualified joining technician as designated by the pipe manufacturer.
- B. Pipe shall be laid to lines and grade shown on the Drawings with bedding and backfill as shown on the Drawings. The tape covering the perforations shall be removed during installation. The pipe shall be installed such that perforations face the bottom of trench.
- C. Following fusion of each joint, the internal fusion bead shall be removed from all 10-inch HDPE pipes or larger. The internal fusion bead shall be removed and extracted from the pipe using a bead trimmer tool as manufactured by R&L Manufacturing of Vancouver, WA or equal. The removal of the internal fusion bead shall be in accordance with the bead trimmer tool manufacturer's operations manual. The internal bead shall be removed during the cooling stages of the fusion process.

Verification that the internal fusion bead was removed completely will be made by the Engineer through examination of the extracted bead and through CCTV video inspection. The extracted bead shall have a double roll back that is similar in appearance to the external bead and possess a smooth root cut. Wall mass removal shall not exceed 1/10th of the pipe wall thickness

- D. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by fabricated plugs, or by other approved means. All plugs shall be OD fitting type plugs. No plugs will be allowed that require insertion of the plug into pipe.
- E. 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 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.

- F. Sections of pipe with cuts, scratches or gouges deeper than allowed shall be removed completely and the ends of the pipeline rejoined.
- G. The pipe shall be joined by the method of thermal butt fusion, as outlined in ASTM D2657 or as recommended by the manufacturer. In tight locations in which the butt fusion equipment cannot be set up, a thermal coupling such as Central Electrofusion Systems or equal shall be used.
- H. Mechanical connections of the polyethylene pipe to auxiliary equipment such as valves, pumps and tanks shall be through flanged connections which shall consist of the following:
 - 1. A stainless steel back-up, polyethylene flange shall be thermally butt-fused to the stub end of the pipe.
 - 2. A Type 316 stainless steel back up ring on both sides of the connection shall be used as approved by the Engineer.
- I. Flange connections shall be provided with a full-face neoprene gasket.
- J. All HDPE pipe must be at the temperature of the surrounding soil at the time of backfilling and compaction.
- K. Installation of pipe shall be observed and accepted by the Engineer prior to backfilling.

3.02 TESTING

- A. All pressure/vacuum pipe shall be field tested. The Contractor shall supply all labor, equipment, material, gauges, pumps, meters and incidentals required for testing. Pressure test each pipe upon completion of the pipe laying and backfilling operations, including placement of any required temporary roadway surfacing.
- B. All pressure pipe shall be tested at 150 percent of the operating design pressure of the pipe unless otherwise approved by the Engineer. The test pressure shall be measured at the highest point along the test section by a recording type pressure gauge and a copy of the readout shall be submitted to the Engineer upon completion of the test. All testing shall be conducted in the presence of the Engineer or his/her designated representative.
- C. Testing shall be conducted after backfilling has been completed and before placement of permanent surface.
- D. Testing procedure shall be as follows:
 - 1. Fill line slowly with water. Maintain flow velocity less than two feet per second.
 - 2. Expel air completely from the line during filling and again before applying test pressure. Air shall be expelled by means of taps at points of highest elevation

3. Apply initial test pressure and allow to stand without makeup pressure for 2 to 3 hours, to allow for diametric expansion or pipe stretching to stabilize.
 4. After this equilibrium period, apply the specified test pressure and turn the pump off. The final test pressure shall be held for 1 to 3 hours.
 5. Upon completion of the test, the pressure shall be bled off from a location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the resident project representative at the point where the pressure is being monitored and shall show on the recorded pressure read-out submitted to the Engineer.
- E. Allowable amount of makeup water for expansion during the pressure test shall conform to Table 3 Test Phase Make-up Amount, from Chapter 2 of the Handbook of Polyethylene Pipe, published by the Plastic Pipe Institute (PPI). If there are no visual leaks or significant pressure drops during the final test period, the installed pipe passes the test.
 - F. If any test of pipe laid disclosed leakage or significant pressure drop greater than that allowed, the Contractor shall, at his/her own expense, locate and repair the cause of leakage and retest the line.
 - G. All visible leaks are to be repaired regardless of the amount of leakage.

3.03 CLEANING AND INSPECTION

- A. At the conclusion of the work, thoroughly clean all of the new pipelines to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the job site. If, after this cleaning, any obstructions remain, they shall be removed. Cleaning of the leachate collection and header pipes shall be conducted by a qualified contractor (such as Jetclean America) experienced in working within landfill environments. All proposed leachate pipes shall be completely cleaned as a requirement for Substantial Completion. Engineer will provide key map of existing leachate pipes that the pipe contractor shall use with the cleaning/inspection logs.
- B. Prior to substantial completion, all proposed and existing leachate collection and header pipes shall be subject to video camera inspection by the Contractor under the observation of the Owner and Engineer. It is the intent to video leachate pipes to locate pipe defects, deviations to gradient, and clogs. When this inspection is performed, the Contractor shall be responsible for preparing the pipes for inspection and furnishing labor as required at no expense to the Owner. Video inspections of the leachate collection and header pipes shall be conducted by a qualified contractor (such as Jetclean America) experienced in working within landfill environments.

Digital videos shall be submitted electronically for review and on portable flash drive.

- C. Video camera system shall be capable of accessing the leachate collection and header lines from the proposed and existing cleanouts. Video camera equipment utilized to inspect the existing leachate pipes must comply with the requirements of Class 1, Division 1 Groups C & D of the National Electrical Code Section NFPA 70.

- D. The videos shall be properly exposed and the camera shall be in proper focus so that good, clear recordings showing detail are produced. Videos shall be identified by audio recordings noting the leachate pipe, any leaks, cracks, or pipe defects. The Contractor shall provide any assistance required by the Engineer to assist the Engineer with visual inspections.

END OF SECTION 02623

SECTION 02640

VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to provide all valves and appurtenances complete with all accessories as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02200: Excavation, Backfill, and Compaction
- B. Section 02623: High Density Polyethylene (HDPE) Pipe

1.03 SUBMITTALS

- A. Submit to the Engineer complete shop drawings and product data for all materials and equipment furnished under this Section. Submittals shall include the following:
 - 1. Manufacturer's literature, illustrations, specifications and engineering data including:
 - a. Dimensions
 - b. Size
 - c. Materials of construction
 - d. Weight
 - e. Protection coating
- B. Test Reports
 - 1. Submit four copies of all certified shop test results specified herein.
- C. Operation and Maintenance Manuals
 - 1. Submit complete operation and maintenance manuals including copies of all approved Shop Drawings
- D. Certificates
 - 1. Submit certificates of compliance where required by referenced standards: For each valve specified to be manufactured and/or installed in accordance with AWWA and other

standards, submit an affidavit of compliance (original and three copies) with the appropriate standards, including certified results of required tests and certification of proper installation.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Valves and appurtenances provided under this Section shall be the standard products in regular production by manufacturers whose products have proven reliable in similar service for at least 10 years. If required, the manufacturer shall furnish evidence of installation in satisfactory operation.
2. All units of the same type shall be the product of one manufacturer.

B. Design Criteria

1. All valves and appurtenances shall be new and in perfect working condition. In no case will used or damaged valves be acceptable.
2. Valves shall be designed for continuous use with a minimum of maintenance and service required and shall perform the required function without exceeding the safe limits for stress, strain or vibration.
3. The selection of equipment to meet the specified design conditions is the responsibility of the Contractor. Both workmanship and material shall be of the very best quality and shall be entirely suitable for the service conditions specified.

1.05 SYSTEM DESCRIPTION

- A. Valves and appurtenances shall be suitable for use with sanitary landfill leachate and landfill gas.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
- B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.
- C. Furnish covers for all openings.
1. All valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.
 2. All valves smaller than 3-in shall be shipped and stored on site until time of use with wood, plywood, or heavy cardboard covers on each valve end.
- D. Store products to permit easy access for inspection and identification. Any corrosion in evidence at the time of Owner acceptance shall be removed, or the valve shall be removed from the job.

- E. Store products in covered storage off the ground.

1.07 COORDINATION

- A. Review installation procedures under other Sections and coordinate with the work which is related to this Section including buried piping installation, site utilities, piping insulation, heating, ventilating and air conditioning, plumbing and chemical feed facilities.
- B. Coordinate the location and placement of concrete thrust blocks when required.

PART 2 PRODUCTS

2.01 GENERAL

- A. All valves shall open counter clockwise.
- B. Valves shall be of the size shown on the Drawings or as noted.
- C. Valves shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard to which they are manufactured cast in raised letters on some appropriate part of the body.
- D. Valves shall have a pressure rating of 150 psi at 70°F or be of the same working pressure as the pipe they connect to, whichever is higher, and suitable for the pressures noted where they are installed.
- E. Valves shall be of the same nominal diameter as the pipe or fittings they are connected to and shall have flanged connections.
- F. Valves shall be especially constructed for buried service.

2.02 VALVE BOXES

- A. All buried valves shall be provided with extension shafts, operating nuts and valve boxes.
 - 1. Extension shafts shall be Type 304 stainless steel and the operating nut shall be 2-in square. Shafts shall be designed to provide a factor of safety of not less than four. Operating nuts shall be pinned to the shafts.
 - 2. Top of the operating nut shall be located 2-in below the rim of the valve box.
 - 3. Valve boxes shall be as manufactured by Mueller; Tyler; or equal and shall be a heavy-pattern cast iron, three-piece, telescoping type box with dome base suitable for installation on the buried valves. Inside diameter shall be at least 4-1/2-in. Barrel length shall be adapted to the depth of cover, with a lap of at least 6-in when in the most extended position. Covers shall be cast iron with integrally-cast direction-to-open arrow, and the word "LEACHATE" shall also be integrally cast. Aluminum or plastic are not acceptable. A means of lateral support for the valve extension shafts shall be provided in the top portion of the valve box.

4. The upper section of each box shall have a top flange of sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve and shall be oval.
5. An approved operating key or wrench shall be furnished.
6. All fasteners shall be Type 304 stainless steel.
7. Valve boxes installed within paved or gravel roadways shall be designed for AASHTO H-20 truck loadings.

2.03 VALVES

A. Buried Gate Valves

Gate valves shall be PVC Type P (Asahi/America or equal), flanged end, nonrising stem with stem extensions and 2" square operating nut. Valve shall have EPDM O-Ring and socket ends. Disc and stem seal shall be of Double O-ring, Viton encapsulated t.

B. Check Valves for the Leachate Sump Pump Station

Check valves for PVC pipe shall be of PVC Series BC with socket or flanged ends as required. Valve bodies shall be union type. PVC ball check valves shall be as manufactured by Celanese Piping Systems, Inc.; Wallace and Tiernan Inc. or equal.

C. Ball Valves

Ball valves shall be PVC Type 1 (Asahi or equal), flanged end, nonrising stem with stem extensions (Asahi Style A or equal), and either an operating lever or gear operator w/handwheel (depending upon pipe size) as shown on the Drawings.

D. Butterfly Valves

1. Butterfly valves shall be of the wafer type (ANSI flanges). Valve body shall be PVC (Type 1, Grade 1), and the disc shall be polypropylene (Type 1).
2. Valve seat shall be Buna-N. Seat shall extend over inner surface plus outside face of body to form self-gasketing feature. Disk and shaft shall be Type 403 stainless steel. Disk and stem seal shall be of double O-ring type and made of same material as valve seat.
3. Operator shall be manual handwheel with traveling nut type and self locking for above ground service and square AWWA nut for In-Line buried service.
4. Valves shall be as manufactured by ASAHI/America, Type 75 or equal.
5. Valves shall be for use with landfill gas and located in a landfill environment.

E. Normally Open Type Combination Air Release/Vacuum Valves

1. The air release/vacuum valve shall permit unrestricted venting of air during filling of the force main and unrestricted entry of air into the force main under vacuum condition due to force main break, or draining of main to prevent pipeline collapse due to vacuum. When force main is filled and pressurized the air release/vacuum valve shall shut off.
2. The air release/vacuum valve shall have stainless steel floats connected by a common stainless steel float stem to maintain an air gap between the lower concave float and upper spherical shut-off float from direct air flow and it shall retain the Buna-N seat in place without distortion for tight shut off or easy removal. The upper float shall be protected from vacuum impact with a rubber bumper. Both floats shall withstand 500 psi or more.
3. The small orifice air release valve inlet size shall be as shown on the Drawings with a 1/4-inch orifice for use at 200 psig. The orifice shall be located in the outlet of the valve and shall be drilled in a 316 stainless steel orifice plate that seals against a Buna-N rubber seat. The valve body and cover flange shall be cast or fabricated 316 stainless steel and shall incorporate a "sanitary clamp" to attach the flange to the body at the outlet. Valves that use traditional bolting to attach the cover flange to the body are not acceptable. The flange clamp must be located at the outlet of the body for ease of cleaning and maintenance. Other clamping locations are not acceptable. All non-sealing internal metal components shall be 316 stainless steel. No plastic, nylon, or fiberglass components will be acceptable.
4. All valves shall be suitable for use in waste water/sewage/leachate type application.
5. Valve shall be Crispin UX series or approved equal – size as indicated on the Drawings

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

- A. During installation of all valves and appurtenances, verify that all items are clean, free of defects in material and workmanship and function properly.
- B. All valves shall be closed and kept closed until otherwise directed by the Engineer.

3.02 INSTALLATION OF BURIED VALVES AND VALVE BOXES

- A. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned. Buried valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve.
- B. Before backfilling, all exposed portions of any bolts shall be coated with two coats of bituminous paint comparable to Bitumastic No. 50 by Kop-Coat, Inc.
- C. Valve boxes shall be installed in accordance with the Drawings and this Specification.

3.03 FIELD TESTS AND ADJUSTMENTS

- A. Conduct a functional field test of each valve, in presence of Engineer to demonstrate that each part and all components together function correctly. All testing equipment required shall be furnished by the Contractor.

END OF SECTION 02640

SECTION 02700

PROTECTIVE COVER AGGREGATE

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, material, equipment and incidentals required to install the leachate collection system aggregate and protective cover aggregate over the fabric cushion as shown on the Drawings and as specified herein. Associated work includes testing, sample collection, excavation, loading, shipping, delivering, stockpiling, installation of aggregate materials.
- B. The protective cover layer consists of 24 inches of material placed over a heavy weigh fabric. The leachate collection and header pipes are surrounded by NCDOT No. 467M stone wrapped in woven fabric. The locations of leachate collection pipes and associated details are indicated on the Contract Drawings.
- C. The Contractor shall furnish the leachate collection system aggregate, NCDOT No. 467M stone, and is responsible for all as shown on the Drawings and as specified herein.
- D. The protective cover aggregate, NCDOT No. 57 stone, is on-site. The Contractor shall haul from the stockpile location and place protective cover in accordance with the Drawings and as specified herein.
- E. If the additional quantity of the protective cover aggregate, NCDOT No. 57 stone, is required, the Contractor shall procure, test, haul, and install in accordance with the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02200: Excavation, Backfill, and Compaction
- B. Section 02271: Fabric Cushion
- C. Section 02272: Filter Fabric
- D. Section 02623: High Density Polyethylene (HDPE) Pipe

1.03 SUBMITTALS

- A. Within 30 calendar days following the Effective Date of the Agreement and before furnishing and installing the protective cover material, the Contractor shall submit the following information in accordance with Section 01300:

1. Identification of the aggregate supplier.
 2. Test results and other documentation as necessary to verify that proposed materials meet the requirements of Paragraph 2.02 of this Section.
 3. Signed certifications from the supplier, with permit numbers and type, stating that the aggregate source is in full compliance with applicable standards and regulations.
 4. A schedule and description of the installation procedure and equipment for the protection cover layer and leachate collection system.
 5. A Quality Control/Quality Assurance Plan for the protective cover layer and leachate collection system installation.
 6. Documentation and related past experience in accordance with Paragraph 1.06.
 7. A 5-gallon bucket sample for laboratory testing, on request, from each protective cover material source to be used for the protective cover layer and leachate collection system.
- B. Within three weeks after completion of the protective cover layer and leachate collection system installation, the Contractor shall submit to the Engineer a survey plan certified by a Land Surveyor Registered in the State of North Carolina showing the elevations of the top of the protective cover layer.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
1. ASTM C33 - Standard for Fine Concrete Aggregate
 2. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
 3. ASTM C136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates
 4. ASTM C289 - Standard Test Method for Potential Reactivity of Aggregates (Chemical Method)
 5. ASTM D75 - Standard Practice for Sampling Aggregates
 6. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils
 7. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 8. ASTM D854 - Standard Test Method for Specific Gravity of Soils

9. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)
 10. ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
 11. ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 12. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
 13. ASTM D3042 - Standard Test Method for Insoluble Residue in Carbonate Aggregate
 14. ASTM D4254 - Standard Test Methods for Minimum Index Density of Soils and Calculation of Relative Density
 15. ASTM D4373 - Standard Test Method for Rapid Determination of Carbonate Content of Soils.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The Quality Control and Quality Assurance consists of laboratory conformance testing of samples supplied from each granular fill and coarse aggregate source and quality control during installation.
- B. The Contractor will retain a Quality Control Laboratory (QCL) that has appropriate equipment and experience to conduct and provide hydraulic conductivity test results in a timely manner in accordance with the Specifications. The Contractor shall coordinate and schedule all tests as required.
- C. Conformance testing requirements are specified in Paragraph 2.02. The purpose of conformance testing is to assure that the supplied samples from each source conform to the Specifications and specified hydraulic conductivity.
- D. Field quality control requirements are specified in Paragraph 3.02. The purpose of field quality control procedures is to assure that the protective cover and leachate collection system aggregate have been installed in accordance with the specifications meeting the specified hydraulic conductivity.

1.06 QUALIFICATIONS

- A. The work shall be performed by a Contractor that has experience in installation of leachate collection system and protective cover aggregate over synthetic liners. The Contractor shall demonstrate proven experience by providing a minimum of one similar completed project with the following information:
 - 1. Type and thickness of installed material.
 - 2. Name and purpose of facility, its location, and date of installation.
 - 3. Name of owner and design engineer. Name and telephone number of contact at the facility who can discuss the project.
- B. The supplier shall show evidence of an adequate supply of material to be provided within the schedule of construction which is homogenous within a designated mine area which is properly permitted by the appropriate local, State and Federal agencies.

1.07 DELIVERY, STORAGE AND HANDLING

- A. If materials are delivered to the site prior to placement approval, materials shall be stockpiled on site in areas as directed by the Engineer. Provision shall be implemented to minimize surface water impact on the stockpile. Removal and placement of granular fill material shall be done in a manner to minimize intrusion of soils adjacent to and beneath the stockpile.

PART 2: PRODUCT

2.01 MATERIAL

- A. NCDOT No. 467M STONE

- 1. Washed stone to be used for filtration around the leachate collection pipe, as shown on the Drawings, shall be sound, hard, durable, resistant to weathering and shall be free of overburden, spoil, shale, limestone and organic material. The stone shall be rounded to sub-angular as defined in ASTM D2488 and meeting Department of Transportation (NCDOT) No. 467M. The Contractor shall provide a certification letter in addition to physical and chemical tests results indicating that the stone meets the NCDOT requirements for No. 467M stone and is granite gneiss and free of limestone. The chemical results shall at a minimum include the results from the "Insoluble Residue in Carbonate Aggregate" test in accordance with ASTM D3042. The weight loss of the aggregate shall be less than five percent.

- B. NCDOT No. 57 STONE

- 1. Stone meeting the gradation of NCDOT No. 57 shall be used for the protective cover layer. NCDOT No. 57 stone shall be sound, hard, durable, resistant to weathering and shall be free of overburden, spoil, shale, limestone, and organic material. The stone shall be NCDOT No. 57 or gradation approved by the Engineer. The

Contractor shall provide a certification letter in addition to physical and chemical tests results indicating that the stone meets the NCDOT requirements for No. 57 stone and is granite gneiss and free of limestone. The chemical results shall at a minimum include the results from the “Insoluble Residue in Carbonate Aggregate” test in accordance with ASTM D3042. The weight loss of the aggregate shall be less than five percent.

2.02 CONFORMANCE TESTING

- A. The Contractor shall submit samples of materials from approved sources for testing by the QAL. If samples do not meet the specified criteria, the Contractor may submit additional samples from sources approved by the Engineer for conformance testing by the QAL at the Contractor's expense.
- B. Conformance testing shall be performed by the QAL on samples from each source of stone to assure compliance with the Specifications. The following test shall be performed on the samples.
 - a. Sieve Analysis (ASTM D422)
 - b. Specific Gravity (ASTM D854)
 - c. Permeability (ASTM D5084)
- C. Gradation analysis shall be performed by the QCL on samples from each source of stone to assure compliance with the Specifications.

PART 3: EXECUTION

3.01 PROTECTIVE COVER PLACEMENT

- A. After installation completion and acceptance of the composite liner system, fabric cushion and related work activities, place the stone to the thickness and areal extents as shown on the Drawings.
- B. During the placement of the protective cover material, no construction equipment shall be allowed directly on the liner or fabric cushion. Any damage to these components shall be repaired immediately in accordance with the specifications. A 4-foot thick traffic surface consisting of rock shall be constructed to support haul trucks traveling over the liner.
- C. Stockpiles of protective cover material during placement shall be deposited in the designated areas without vehicles traveling on the fabric cushion. Protective cover material shall be then pushed over the exposed areas of the fabric cushion with bulldozers. Advancement of protective cover material shall be achieved by pushing a minimum 2-foot-thick lift ahead of the dozer blade.

- D. Only low ground pressure dozers (10 psi or less track pressure) shall be used for spreading and grading of the protective cover material. Only large radius turns by the loader and other equipment shall be permitted as sharp turns may damage the liner.
- E. The protective cover shall be placed on slopes starting at the toe of the slope and spreading toward the top of the slope.
- F. Protective cover shall only be spread when the liner is laying evenly over the base of the landfill. Aggregate shall not be spread over "standing waves" in the liner that form during periods of high temperature and direct sunlight. A standing wave is defined as a ripple in the liner in which the height of the ripple (as measured from the clay surface) exceeds the width of the ripple. If standing waves are occurring during peak temperature hours, the spreading operation shall be limited to mornings (before 10:00 am) and evenings (after 6:00 pm) or hours agreed upon by the Engineer and Contractor.
- G. No material shall be placed, spread, or compacted while the ground or material is frozen or thawing or during unfavorable weather conditions.
- H. The leachate piping shall be installed as specified in Section 02623, and shall be backfilled with NCDOT No. 467M Stone to the depth and width shown on the Drawings. Care shall be taken during backfilling of the pipe to assure the pipe will not be gouged or otherwise damaged. Excavation of the trench will be performed with a backhoe bucket equipped with a protective sleeve over the bucket teeth or by another method approved by the Engineer. The Contractor shall exercise extreme care not to disturb or damage the underlying fabric or liner.
- I. The NCDOT No. 467M Stone shall be mounded over the trench as indicated on the drawings.

3.02 FIELD QUALITY CONTROL

- A. Periodic conformance testing shall be conducted by the Contractor's QCL as specified in Paragraph 2.02.
- B. The protective cover thickness shall be confirmed by a topographic survey performed on a 50-foot grid as specified in Section 01050. Thickness certifications shall be measured perpendicular to slope surfaces as specified in Section 01050. Areas of insufficient thickness shall be filled to the required depth at no additional cost to the Owner.

END OF SECTION 02700

SECTION 02776

HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required and install High Density Polyethylene (HDPE) geomembrane as shown on the Drawings and as specified herein.
- B. An electrical leak location survey is required and site preparation shall be coordinated with the electrical leak location survey subcontractor. Preparation for electrical leak location survey per Paragraph 3.08 is the Contractor's responsibility.

1.02 RELATED WORK

- A. Section 02200: Excavation, Backfill and Compaction
- B. Section 02271: Fabric Cushion
- C. Section 02277: Geosynthetic Clay Geomembrane
- D. Section 02278: Compacted Soil Liner

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, and within 30 calendar days from the Notice to Proceed, submit the following information:
 - 1. Submittals relating to geomembrane manufacturer and geomembrane
 - a. Corporate background
 - b. Manufacturing capabilities:
 - (1) Information on factory size, equipment, personnel, number of shifts per day and production capacity per shift.
 - (2) List of material properties and samples of geomembrane with attached certified test results.
 - (3) Manufacturer's quality control program and manual including description of laboratory facilities.

- (4) A list of ten completed facilities totaling a minimum of five million square feet, for which the manufacturer has manufactured HDPE geomembrane. The following information shall be provided for each facility.
 - a) Name and purpose of facility, its location and date of installation.
 - b) Name of owner, project manager, design engineer and installer.
 - c) Geomembrane thickness and surface area.
 - d) Information on performance of the facility.
 - c. The origin of the resin to be used in the manufacturing of geomembrane including the supplier's name and production plant, as well as brand name and number. In addition, the Contractor shall include the Certificate of Analysis from the resin supplier.
 - d. Copy of the Manufacturer's quality control certificates signed by the Quality Control Manager in conformance with Paragraphs 2.01 and 2.02.
 - e. Certification that the HDPE geomembrane and extrudate produced for this project have the same properties.
 - f. A "Sample Warranty" in accordance with Paragraph 1.08.
2. Submittals relating to installer:
- a. Background information including Approved Installation Contractor (AIC) status documentation as issued by the International Association of Geosynthetic Installers
 - b. Installation capabilities:
 - (1) Information on equipment (including tensiometer) and personnel.
 - (2) Anticipated average daily production.
 - c. A list of five completed facilities totaling two million square feet for which the installer has installed HDPE geomembrane. The following information shall be provided for each facility:
 - (1) Name and purpose of facility, its location and date of installation.
 - (2) Name of owner, design engineer, manufacturer and name and telephone number of contact at the facility who can discuss the project.
 - (3) Thickness of geomembrane and surface area of the installed geomembrane.
 - (4) Type of seaming, patching and tacking equipment.
 - (5) A copy of the manufacturer's certification or approval letter.

3. Submittals relating to the Electrical Leak Location Survey Contractor
 - a. Company background including number of years of experience in proposed method.
 - b. Electrical leak location capabilities including a minimum of 10 million square feet of the proposed method.
 - c. Contractor shall submit a list of at least five similar completed projects using the proposed method.
 - (1) Name and purpose of facility, its location and date of installation.
 - (2) Name of client for leak location survey and telephone number of contact who can discuss the project.
 - (3) Lining system and surface area of the electrical leak location survey.
 4. Material Testing Requirements
 - a. See Specification Section 02277, Paragraph 1.03A.3. for interface material strength testing.
- B. Within 45 days prior to geomembrane installation submit the following
1. Shop drawings
 - a. Proposed panel layout showing the installation layout identifying field seams as well as any variance or additional details which deviate from the Drawings.
 - b. Details of seaming the geomembrane, anchoring, connections, penetrations and other construction details.
 - c. Electrical Leak Location Survey Plan per Paragraph 3.08 A.
 2. Installation schedule
 3. Quality Control Manual
 - a. A quality control manual that specifically defines the quality assurance program during installation. The manual shall include daily procedures, welding techniques, field testing procedures, lab testing procedures, specific steps that are to be taken in the event of a failure or defect, personnel requirements, levels of authority and all other information necessary to ensure a high quality geomembrane installation.
 4. Field Personnel Information

- a. Resume of the installation supervisor to be assigned to the project. The installation supervisor shall have installed or supervised the installation and seaming of a minimum of two million square feet of HDPE geomembrane.
- b. Resume of the master seamer to be assigned to the project. Master seamer must have completed a minimum of one million square feet of geomembrane seaming using the type of seaming apparatus proposed for use on this project.
- c. Resume of the quality control personnel to be assigned to the Project along with pertinent experience information.
- d. A list of personnel performing field seaming operations along with pertinent experience information.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

- 1. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- 2. ASTM D1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting
- 3. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- 4. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
- 5. ASTM D1603 - Standard Test Method for Carbon Black in Olefin Plastics
- 6. ASTM D3895 - Standard Test Method Oxidative Induction Time of Polyolefins by Differential Scanning Calorimetry
- 7. ASTM D4218 - Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
- 8. ASTM D4833 - Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
- 9. ASTM D5397 - Procedure to Perform a Single Point Notched Constat Tensile Load - Appendix (SP-NCTL) Test
- 10. ASTM D5596 - Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics

11. ASTM D5721 - Practice for Air-Oven Aging of Polyolefin Geomembranes
12. ASTM D5885 - Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
13. ASTM D5994 - Test Method for Measuring the Core Thickness of Textured Geomembranes
14. ASTM D6392 - Standard Test Method for Determining the Integrity of Non-reinforced Geomembranes Seams Produced Using Thermo-Fusion Methods
15. ASTM D6693 - Test method for Tensile Properties of Plastics
16. ASTM D8265 - Standard Practices for Electrical Methods of Mapping Leaks in Installed Geomembranes

B. Geosynthetic Research Institute (GRI)

1. GM 10: Specifications for the Stress Crack Resistance of Geomembrane Sheet
2. GM 11: Accelerated Weathering of Geomembranes using a Fluorescent UVA – Condensation Exposure Device
3. GM 12: Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gage
4. GM 13: Test Properties, Testing Frequency, and Recommendation Warrant for High Density Polyethylene (HDPE) Smooth and Textured Geomembrane
5. GM 19: Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. In addition to manufacturer and installer requirements for qualifications and certification specified in Paragraph 1.03, the Quality Assurance consists of conformance testing of the material delivered to the site and field quality control during installation.
- B. Conformance testing requirements are specified in Paragraph 2.03. The purpose of conformance testing is to assure that the supplied material conforms to the specifications and to the manufacturer's quality control certificates.

C. Field quality control requirements are specified in Paragraph 3.06. The purpose of field quality control procedures is to assure that the geomembrane has been installed in accordance with the specifications and manufacturer's recommendations.

D. Quality Control Plan

1. The forms in Appendix A for geomembrane quality control documentation shall be used for field installation documentation. Alternative forms, which provide the same level of detail, may be used for documentation as approved by the Engineer.

E. Geomembrane Quality Control Documentation

1. Pre-installation Conference

- a. Prior to commencing work, a pre-installation conference shall be held and the following project personnel shall be identified by name and recorded in the project files:

- Contractor
- Contractor's Representative
- Engineer's Field Representative
- Installation Supervisor
- Master Seamer
- Quality Assurance Laboratory
- Quality Assurance Technician

- b. Two duplicate project files shall be maintained. One shall be maintained by the Engineer's Field Representative and the other shall be maintained by the Installation QC Technician. At the end of each work week the files shall be updated and checked to assure that copies of all pertinent project information are included in each file.

- c. Blank copies of the following project forms shall be available onsite throughout the duration of the project:

<u>Form No.</u>	<u>Title</u>
CQC - 100	Liner Project QC Log
CQC - 101	Receiving QC Log
CQC - 102	Personnel QC Log
CQC - 103	Daily QC Report Pre-weld Testing
CQC - 104	HDPE Geomembrane Installation Tracking Log
CQC - 105	Seaming Log
CQC - 106	Patch Placement Log
CQC - 107	Destructive Test Log
CQC - 108	Damage and/or Failure Report

1.06 QUALIFICATIONS

A. Manufacturer

1. The manufacturer of the lining material described hereunder shall have previously demonstrated his/her ability to produce this geomembrane by having at least 5 years continuous experience in the manufacture of HDPE geomembrane and successfully manufactured a minimum of 10 million square feet of similar geomembrane material for hydraulic lining installations.

B. Installer

1. The installer shall be the manufacturer or an approved installer trained and certified to install the manufacturer's geomembrane. Installation shall be performed under the constant direction of a single field installation supervisor who shall remain on site and be in responsible charge, through the geomembrane installation, for geomembrane layout, seaming, patching, testing, repairs and all other activities required by the installer. The field installation supervisor shall have installed or supervised the installation and seaming of a minimum of two million square feet of HDPE geomembrane.

1.07 DELIVERY, STORAGE AND HANDLING

- A. The geomembrane rolls shall be packaged and shipped by appropriate means to prevent damage of the geomembrane rolls. Off-loading and storage of the geomembrane is the responsibility of the Contractor. The Contractor shall be responsible for replacing any damaged or unacceptable material at no additional cost to the Owner.
- B. No off-loading shall be performed unless the EFR is present. Damage during off-loading shall be documented by the EFR. All damaged rolls must be separated from the undamaged rolls until the proper disposition of that material has been determined by the Engineer.
- C. The geomembrane rolls shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions and excessive heat that may damage the geomembrane material. The rolls shall be stored on a prepared surface (not wooden pallets) and shall not be stacked more than two rolls high.

1.08 MATERIAL WARRANTY

- A. The HDPE geomembrane manufacturer shall warrant the geomembrane against manufacturing defects and material degradation under outdoor exposure for a period of five (5) years from the date of final payment and acceptance in accordance with the General Conditions. The manufacturer shall repair or replace, at no additional cost to the Owner, any material which fails from the above causes within the warranty period. The manufacturer shall furnish a written warranty covering the requirements of this Paragraph.

1.09 GUARANTEE

- A. The Contractor shall guarantee the HDPE geomembrane against defects in installation and workmanship for the period of two (2) years commencing with the date of final payment and acceptance in accordance with the General Conditions. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no additional cost to the Owner.

1.10 DEFINITIONS AND RESPONSIBILITIES

A. Contractor

- 1. The Contractor is the firm or corporation with whom the Owner has entered into agreement to construct the project. The Contractor is responsible for all submittals by the manufacturer and the installer as required by the Specifications. The Contractor is responsible for scheduling and coordination of the required work with the manufacturer and the installer to complete the project. The Contractor is responsible for furnishing as-built drawings and a copy of the complete documentation of the liner system. The Contractor is also responsible for daily updating of the design drawings onsite and for any and all deviations from these drawings. All deviations must be initialed and approved by the Engineer's Field Representative.

B. Manufacturer

- 1. The manufacturer is the firm or corporation responsible for production of the geomembrane material to be used in the project. The manufacturer shall produce a consistent product meeting the project specifications and shall provide quality control documentation for the product specified herein.

C. Installer

- 1. The installer is the firm responsible for installation of the geomembrane. The installer shall be the manufacturer or an approved installer trained and certified to install the manufacturer's geomembrane. The Installer shall be responsible for field handling, storing, placing, seaming, and all other aspects of the geomembrane installation.

PART 2: PRODUCTS

2.01 MATERIALS

A. General

- 1. The geomembrane shall be manufactured of new, prime first-quality products designed and manufactured specifically for the purpose of liquid containment in hydraulic structures and chemically resistant to leachate.

2. The geomembrane material shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.
3. The sheets shall be manufactured in a minimum 15-ft seamless width. Labels on the roll shall identify the thickness, length, width, roll number and manufacturer's lot number.
4. The textured sheet must not delaminate during tensile testing (i.e., textured layers and "particles" of texture must not separate).

B. Properties

1. The geomembrane rolls shall be 60-mil textured HDPE and shall meet the specified physical, mechanical and chemical property requirements listed in GRI GM13.

C. Other Materials

1. Extrudate welding rods shall be of the same compound as the geomembrane and supplied by the manufacturer and shall be delivered in the original sealed containers. Each container shall have a label bearing the brand name, manufacturer's lot number and complete directions as to proper storage.
2. Boots and shrouds for pipe penetration shall fit snugly around the pipe. Prefabricated material shall be designed to fit site specific conditions for the intended slope and size of pipe.

2.02 QUALITY CONTROL DOCUMENTATION

A. Prior to installation commencement of any geomembrane material, the Contractor shall provide the following information certified by the manufacturer for the delivered geomembrane.

1. Origin, identification and production of the resin (supplier's name, brand name and production plant).
2. Copies of quality control certificates issued by the resin supplier.
3. Manufacturer's certification verifying that the quality of the resin used to manufacture the geomembrane meets the requirements specified in Paragraph 2.01
4. Each roll delivered to the project site shall have the following identification information:
 - Manufacturer's name
 - Product identification
 - Thickness
 - Roll number
 - Roll dimensions
 - Lot number

5. Quality control certificates, signed by the manufacturer's quality assurance manager, shall be submitted for each roll delivered to the site. Each certificate shall have roll identification number, sampling procedures, frequency and test results. At a minimum, test results shall be provided for each roll delivered to the site in accordance with test requirements specified in GRI-GM13.

2.03 CONFORMANCE TESTING

- A. Conformance testing shall be performed by an independent, GRI certified, Quality Assurance Laboratory (QAL) employed by the Contractor. A qualified technician from the QAL shall obtain samples from the rolls, mark the machine direction and identification number at a frequency of one sample per 100,000 square feet, or one sample per lot, whichever results in the greater number of conformance tests. The following conformance tests shall be conducted at the laboratory:
 - Thickness
 - Asperity Height
 - Density
 - Tensile properties
 - Tear resistance
 - Puncture resistance
 - Carbon black content
 - Carbon black dispersion
- B. These conformance tests shall be performed in accordance with GRI-GM13. All costs for conformance testing will be paid by the Contractor.
- C. All conformance test results shall be reviewed by Engineer and accepted or rejected, prior to the placement of the geomembrane. All test results shall meet, or exceed, the property values listed in GRI-GM13. The course of action implemented for retesting failing tests shall be approved by the Engineer. In case of failing test results, the manufacturer may request that another sample be retested by the independent laboratory with manufacturer's and Engineer's technical representative present during the testing procedures. This retesting shall be paid for by the Contractor. The manufacturer may also have the sample retested at two different laboratories approved by the Engineer. If both laboratories report passing results, the material shall be accepted. If both laboratories do not report passing results, all geomembrane material from the lot representing the failing sample will be considered out of specification and rejected.

PART 3: EXECUTION

3.01 COMPACTED SOIL LINER AND GCL PREPARATION

- A. Preparation of the compacted soil liner surface shall be as specified in Section 02278.
- B. Preparation of the geosynthetic clay liner (GCL) surface shall be as specified in Section 02277.

- C. The surface of the compacted soil liner shall be smooth, uniform, free from sudden changes in grade (such as vehicular ruts), rocks, stones, debris and deleterious materials. The moisture content of the compacted soil liner must be maintained within the project specifications until the geomembrane has been installed. If excessive drying occurs, the Contractor shall rehydrate and compact the affected area to the Engineer's satisfaction. During actual placing and seaming of the geomembrane, the compacted soil liner surface shall be kept free of all standing water. If the compacted soil liner surface below the geomembrane becomes wet and unstable, it shall be dried and recompact to the Engineer's satisfaction. If drying and recompacting the material is insufficient, the unstable material must be removed and replaced with approved material.
- D. The GCL surface shall be smooth, uniform, free from sudden changes in grade (such as vehicular ruts), rocks, stones, debris and deleterious materials.
- E. Upon completing placement of GCL panels in any area, the HDPE geomembrane shall be immediately installed over the GCL panels to prevent the GCL from becoming wet as required in Section 02277.
- F. Before the geomembrane installation begins, the Contractor and installer shall verify in writing and submit to the Engineer:
 - 1. Lines and grades are in conformance with the Drawings and Specifications.
 - 2. The surface area to be lined has been rolled and compacted, free of irregularities and abrupt changes in grade.
- G. The Contractor shall not proceed with geomembrane installation until a complete report on the compacted soil liner thickness and hydraulic conductivity tests has been submitted and approved by the Engineer. If the Contractor proceeds with geomembrane installation and associated layers (fabric cushion and protective cover material) prior to completion of the report, the Contractor will do so at his/her own risk. If any compacted soil liner tests fail, the Contractor will be required to remove overlying liner system layers, repair deficient compacted soil liner area(s) and reinstall the liner system in accordance with project specification requirements. Any liner system materials damaged during the repair work shall be replaced with new material. All costs associated with such actions will be paid for entirely by the Contractor including, but not limited to, labor, additional liner system material, testing, labor and material costs incurred by the Engineer to perform additional inspection services.

3.02 ANCHOR TRENCH

- A. The anchor trench shall be constructed as shown on the Drawings and as specified herein.
- B. Slightly rounded corners shall be provided in the trench to avoid sharp bends in the geomembrane.
- C. The anchor trench shall be adequately drained to prevent water ponding and softening of adjacent soils. The anchor trench shall be backfilled with fill materials as shown on the

Drawings and compacted to 95 percent standard proctor density, ASTM D698 as specified in Section 02200.

- D. The amount of trench open at any time shall be limited to one day of geomembrane installation capacity. Geosynthetic material in the anchor trench shall be temporary anchored with sandbags or other suitable materials.
- E. Backfilling of the anchor trench shall be conducted when the geomembrane is in its most contracted (taut) state.
- F. Care shall be taken when backfilling and compacting the trenches to prevent any damage to the lining materials.
- G. If the anchor trench is located in a clay susceptible to desiccation, the amount of trench open at any time shall be limited to one day of liner installation capacity

3.03 GEOMEMBRANE PLACEMENT

A. Weather Conditions

- 1. Geomembrane placement shall not proceed at an ambient temperature below 32 degrees Fahrenheit or above 104 degrees Fahrenheit unless otherwise authorized, in writing, by the Engineer or his/her field representative. Geomembrane placement shall not be performed during precipitation, excessive moisture, in an area of ponded water, or excessive winds that adversely affects the geomembrane placement.

B. GCL Care during Installation

- 1. The equipment used to deploy the geomembrane shall not cause rutting of the GCL surface. If rutting occurs, the Contractor shall suspend all geomembrane placement activities and repair the ruts and immediately employ an alternative method for geomembrane deployment. Geomembrane rolls shall be placed using spreader and rolling bars with cloth slings. If a sheet must be relocated a distance greater than its width, a slip sheet shall be used.
- 2. The installer shall not drag the geomembrane panels over the GCL.

C. Method of Placement

- 1. Each panel of the geomembrane shall be rolled out and installed in accordance with the approved shop drawings prepared by the Contractor. The layout shall be designed to keep field seams of the HDPE geomembrane to a minimum and consistent with proper methods of HDPE geomembrane installation. Panel layout and deployment shall be such that all seams run down slope on the perimeter berms (i.e., perpendicular to top of slope). Horizontal seams across the slope are not permitted. If white geomembrane is used, the white textured surface will be installed facing up. For liner placed on 4 to 1 or steeper slopes, the seams shall be oriented in the direction of the slope. Horizontal seams on 4 to

1 slopes or steeper shall not be allowed except for cases in which it is unavoidable. In these instances, a cap strip shall be placed over the seam.

2. Each geomembrane panel shall be identified by panel number, roll number and date of deployment. The geomembrane panel number shall be placed on the ends and in the middle of each panel.
3. The Engineer's Field Representative shall inspect each panel, after placement and prior to seaming, for damage and/or defects. Defective or damaged panels shall be replaced or repaired, in accordance with Paragraph 3.07G.
4. All geomembrane shall be anchored as shown on the Drawings and consistent with manufacturer's recommendations.
5. Personnel working on the geomembrane shall not smoke, wear damaging shoes or involve themselves in any activity that may damage the geomembrane.
6. All edges of the geomembrane shall be properly weighted to avoid uplift due to wind. The geomembrane shall be properly weighted with sand bags to avoid uplift due to wind. Sand bag material shall be sufficiently close-knit to prevent soil fines from working through the bags and discharging on the geomembrane.
7. Vehicular traffic across the geomembrane shall not be allowed.
8. All damaged areas and destructive sample locations shall be recorded and located on the as-built drawings.
9. When tying into existing geomembrane, all excavation of previously installed geomembrane shall be performed by hand to prevent damage.
10. The geomembrane shall be kept free of debris, unnecessary tools and materials. In general, the geomembrane area shall remain uncluttered in appearance.
11. Equipment necessary to perform the installation (generators, compressors, etc) shall have a scrap geomembrane sheet placed underneath to protect the installed geomembrane from possible damage.
12. No welder or testing equipment shall be allowed to remain on top of the installed geomembrane overnight. All equipment must be removed and stored away from the installed geomembrane.
13. No fueling of installer's equipment will be allowed on top of the installed geomembrane. No fuel containers shall be allowed on the geomembrane.
14. Any vehicle used prior to or after liner placement shall be first approved by the EFR. All vehicles are restricted from traveling on the liner material unless a temporary access is constructed.

15. To prevent a "trampoline effect" from forming, the Contractor shall place sufficient sand bags on the geomembrane along the toe of slopes to ensure full contact of the geomembrane with the clay liner surface. In addition, the horizontal seams nearest the toe of slope shall remain unwelded until all other seams in the area are completed. The final seam shall be welded when the geomembrane is cool and fully contracted. Care shall be taken to ensure that the geomembrane contacts the subgrade in all locations before completing the seam.

D. Liner Boots (Pipe Penetrations)

1. HDPE boots or shrouds shall be furnished and installed where indicated on the Drawings. The boots shall be of the same material as the geomembrane.
2. The geomembrane end of the boots shall terminate in a skirt section suitable for welding to the geomembrane liner. The overlap between the boot and the geomembrane shall be approximately 18 inches. The boot shall be welded to the geomembrane as previously specified herein.
3. Boots and shrouds shall fit snugly around the pipe. Prefabricated material shall be designed to fit site specific condition, for the intended slope and size of pipe.
4. A Neoprene rubber gasket shall be used between the boot or shroud and the pipe with a stainless steel clamp. An HDPE sacrificial sheet shall be used between the boot or shroud and the clamp for protection.
5. For pipes larger than 4-in diameter, a second clamp shall be used. The fastener of the second clamp shall be located on the opposite side of the pipe from the first clamp, to compensate for uneven pressure and elongation.

3.04 FIELD SEAMS

- A. Individual panels of geomembrane shall be laid out and overlapped by a minimum of 4 inches prior to welding. The area to be welded shall be cleaned and prepared in accordance with the quality control welding procedures approved by the EFR.
- B. Double track hot wedge fusion welder shall be used for straight welds.
- C. Extrusion welder shall be used for patches, repairs, and penetration boots.
- D. The repairs and patches shall have the white surface of the geomembrane facing up so that the final product is a white geomembrane with black welds on white repairs, if white geomembrane is used.
- E. The welding equipment used shall be capable of continuously monitoring and controlling the temperatures in the zone of contact where the machine is actually fusing the geomembrane

material so as to ensure that changes in environmental conditions will not affect the integrity of the weld.

- F. No "fish mouths" will be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and a patch fusion weld shall be applied. All welds upon completion of the work shall be tightly bonded. Any geomembrane area showing injury due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired with an additional piece of geomembrane. The number of patches per 100-ft length shall not exceed five. If more than five patches per 100-ft length are necessary, then the entire 100-ft length of seam shall be removed. Further welding will cease at this time and the Engineer shall be notified.
- G. All seams shall have a seam number that corresponds with the panel layout numbers. The numbering system shall be used in the development of the as-built drawings. Seam numbers shall be derived from the combination of the two panel numbers that are to be welded together.
- H. All fusion welded "T" seams (i.e., the result of the geomembrane panels placed perpendicular to each other) shall be double welded where possible. The extrusion process shall be used for the second weld.
- I. All extrudate shall be free of dirt, dry and protected from damage.
- J. If an extrusion welder is stopped for longer than one minute, it shall be purged to remove heat-degraded extrudate. All purged extrudate shall be placed on a sacrificial sheet and disposed of.
- K. All seams constructed on sloped surfaces shall be perpendicular to the top and toe of the slope (vertical seams).
- L. All panels placed on sloped surfaces shall extend 5-ft inward (on the flat) from the toe of slope or edge of trench.
- M. All end seams shall be staggered a minimum of 5-ft in length between contiguous panels. No end seams are allowed on slopes 25 percent (4 horizontal and 1 vertical) or greater, unless otherwise approved by the Engineer.
- N. To prevent moisture buildup during fusion welding, it may be necessary to place a movable protective layer of plastic (skid sheet) directly below each overlap of geomembrane that is to be seamed.
- O. If required, a firm substrate shall be provided by using a flat board or similar hard surface directly under the seam overlap to achieve proper support.
- P. All seam welds shall extend to the full extent into the anchor trench.
- Q. All factory seams, field seams and repair welds shall meet seam strength requirements specified in GRI-GM19.

- R. All seams shall be "shingled" or "rain-lapped".

3.05 SEAMING WEATHER CONDITIONS

A. Normal Weather Conditions

1. The normal required weather conditions for seaming are:
 - a. Ambient temperature higher than 32 degrees Fahrenheit and lower than 104 degrees Fahrenheit.
 - b. No precipitation or other excessive moisture, such as fog or dew.
 - c. No excessive winds.
2. These weather conditions shall be maintained during the seaming process.

B. Cold Weather Conditions

1. If the ambient temperature is below 32 degrees Fahrenheit, the following procedures shall be implemented:
 - a. Preheating the surface of the geomembrane to achieve normal temperature range.
 - b. Preheating may be waived by the Engineer's Field Representative if the installer demonstrates that satisfactory welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
 - c. Preheating devices shall be approved by the manufacturer.
 - d. Care shall be taken to assure that surface temperatures are not lowered below the minimum required surface temperature for welding due to winds.
 - e. Additional destructive tests samples shall be taken at the discretion of the Engineer.
 - f. Test seams, as described in Paragraph 3.06A, shall be performed under the same ambient temperature conditions as the actual seams.

C. Warm Weather Conditions

1. If the ambient temperature is above 104 degrees Fahrenheit, no seaming of geomembrane shall be permitted unless the installer can demonstrate, to the satisfaction of the Engineer that geomembrane seam quality is not adversely impacted.
2. Test seams shall be performed under the same ambient temperature conditions as the actual seams.

3. Additional destructive tests shall be taken at the discretion of the Engineer.

3.06 FIELD QUALITY CONTROL

A. Start-up Testing

1. A test weld 3-ft long from each welding machine shall be run upon the beginning of each shift and every four hours thereafter, under the same conditions as exist for the geomembrane welding. The test weld shall be marked with date, time of day, seamer's initials, temperature and speed settings (for fusion welds) or temperature and preheat settings (for extrusion welds), and machine number. A tensiometer shall be required to be on-site before and during geomembrane installation for the purpose of testing samples. Six 1-in wide specimens shall be cut from the test weld and tested on-site at the presence of the Engineer's Field Representative (three for peel and three for shear strength) in accordance with GRI-GM19. No welder may start work until the sample weld has been approved by the Engineer's Field Representative.
2. Test seams shall be performed under the same conditions as the actual seams and shall be at least 3-ft long and 1-ft wide after seaming. Material for test seams shall be cut out of the approved geomembrane rolls.

B. Nondestructive Seam Testing

1. The installer shall perform nondestructive test on all field seams over their full length. The purpose of this test is to assure continuity and integrity of the seams. Vacuum and air pressure tests shall be used for nondestructive testing. The vacuum test shall be used for extrusion welds. The air pressure test shall be used for double track hot wedge welds.
2. Vacuum Testing
 - a. Equipment for testing single wedge fusion seams and extrusion seams shall be comprised of the following:
 - (1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly and a vacuum gage.
 - (2) A vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
 - (3) A rubber pressure/vacuum hose with fittings and connections.
 - (4) A plastic bucket and wide paint brush.
 - (5) A soapy solution.
 - b. The following procedures shall be followed by the installer:

- (1) Excess sheet overlap shall be trimmed away.
 - (2) Clean the window, gasket surfaces and check for leaks.
 - (3) Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
 - (4) Wet a strip of geomembrane approximately 12-in by 48-in (length of box) with the soapy solution.
 - (5) Place the box over the wetted area and compress.
 - (6) Close the bleed valve and open the vacuum valve.
 - (7) Ensure that a leak-tight seal is created.
 - (8) For a minimum period of ten seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.
 - (9) If no bubbles appear after ten seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 3-in overlap and repeat the process.
 - (10) All areas where soap bubbles appear shall be marked and repaired in accordance with Paragraph 3.07G and then retested.
 - (11) All test locations which have passed vacuum testing shall be marked with the test date and individual performing the test.
- c. If the seam is not accessible to vacuum box equipment and cannot be tested prior to final installation, the seaming operations shall be observed by the EFR for uniformity and completeness.
3. Air Pressure Testing (for double track fusion seams only)
- a. The following procedures are applicable to those processes which produce a double seam with an enclosed space.
 - b. Equipment for testing double fusion seams shall be comprised of the following:
 - (1) An air pump equipped with pressure gage capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane.
 - (2) A manometer equipped with a sharp hollow needle, or other approved pressure feed device.

c. The following procedures shall be followed by the installer.

- (1) Seal both ends of the seam to be tested. The length of seam shall not exceed 500-ft without approval by the EFR.
- (2) Insert needle or other approved pressure feed device into the tunnel created by the double wedge fusion weld.
- (3) Energize the air pump to a pressure between 25 and 30 psi. After allowing two minutes for relaxation, the pressure shall be monitored over a test period not less than five minutes.
- (4) If the loss of pressure exceeds 4-psi, or the pressure does not stabilize, the weld shall be considered faulty (unless the Installer can demonstrate that monitoring for an additional five minutes does not cause an additional loss in pressure in excess of 1 psi, and that the pressure stabilizes within the second monitoring period). Locate the faulty area, repair in accordance with Paragraph 3.07G and retest.
- (5) If the faulty area cannot be isolated and repaired, the length of seam which cannot be tested shall be capped with geomembrane strip, extrusion welded and vacuum tested. The seam shall be documented as a failed seam indicating the corrective measure.
- (6) If the pressure loss is less than 4 psi after five minutes, cut the air channel on the opposite end the pressure device to confirm there is no blockage and verify the length of the seam tested. Remove needle of other approved pressured feed device and seal with an extrusion weld.
- (7) Remove needle or other approved pressure feed device and seal.
- (8) All test locations which have passed air pressure testing shall be marked with the test date and individual performing the test.

d. Destructive seam testing shall be performed in accordance with Paragraph 3.07.

3.07 DESTRUCTIVE SEAM TESTING

- A. The purpose of the destructive testing is to evaluate seam strength properties. A minimum of one test sample shall be obtained per 500 feet of performed seam length. The location of samples shall be determined by the Engineer's Field Representative. Selection of such locations may be prompted by suspicion of overheating, contamination, or other potential cause that may adversely impact the welds. Location at samples shall not be revealed to Installer in advance. Sampling shall be performed by the installer. The Contractor shall forward the samples to the QAL for testing and shall pay for the testing.

B. Sampling Procedures

1. Samples shall be cut by the installer at locations chosen by the Engineer's Field Representative as the seaming progresses.
2. The seams shall not be covered by another material before they have been tested and accepted by Engineer's Field Representative.
3. Upon obtaining each sample, assign a number to the sample and mark it accordingly.
4. Record sample location on layout drawing.
5. Record purpose of the sample, statistical routine or suspicious weld area.
6. Holes in the geomembrane resulting from destructive seam testing shall be immediately repaired in accordance with Paragraph 3.07G.

C. Size and Disposition of Samples

1. Two samples, 12-in wide by 18-in shall be taken for field testing. Each of these samples shall be cut with a 1-in wide die, with the seam centered parallel to the width. The distance between these two samples shall be 36-in. If all samples pass the field test described in Paragraph 3.07D, a sample for laboratory testing shall be taken.
2. The sample for laboratory testing shall be located between the samples for field testing. The sample for laboratory testing shall be 12-in wide by 36-in long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:
 - a. One portion to the installer for optional laboratory testing, 12-in by 12-in.
 - b. One portion for Quality Assurance Laboratory testing, 12-in by 12-in.
 - c. One portion to the Engineer for archive storage, 12-in by 12-in.

D. Field Testing

1. The following shall be performed by the Installer in the presence of the Engineer:
 - a. The installer shall cut six 1-in wide replicate specimens from the field testing samples to be tested for shear and peel strength, in accordance with the criteria set in GRI GM19.
 - b. The installer shall test three specimens for shear seam strength and three for peel strength. All replicate test specimens shall pass for the seam to be acceptable.
 - c. Samples shall be tested with a tensiometer equipped with a drive/pull apparatus adjusted to a pull rate of 2-in per minute for both peel and sheer testing. Each

sample shall be tested until film tearing bond (FTB) is achieved. At a minimum, the required pass criteria for peel and shear shall be as specified in GRI GM19.

- d. Any specimen that fails through the weld or through the fusion at the weld sheet interface is a non-FTB (Film Tearing Bond) break and shall be considered a failure even if it achieves the acceptable strengths.

E. Quality Assurance Laboratory Test

1. The Contractor shall package and ship destructive test samples to the GRI accredited independent QAL employed by the Contractor.
2. Laboratory test shall include shear and peel strength tests. The minimum acceptable values obtained in these tests shall be in accordance with GRI-GM19.
3. The laboratory shall cut the sample to 1-inch wide coupons using die cast or other means. At least ten (10) coupons shall be cut for peel and shear test.
4. At least five specimen shall be tested each for shear and peel strength. A passing test shall meet the minimum required values in all five specimens tested for each method.
5. The QAL shall provide verbal test results to the Engineer no more than 48 hours after they receive the samples. The Engineer shall review the laboratory results as soon as they become available.

F. Procedures for Destructive Test Failure

1. The following procedures shall apply whenever a sample fails a destructive test, whether that test is conducted in the field or by the QAL. The Installer has two options.
 - a. The Installer can repair the seam between any two passing test locations in accordance with Paragraph 3.07G.
 - b. The Installer can retrace the welding path to an intermediate location a minimum of 10-ft on each side of the failed sample. The sample shall be tested in the field. Subsequent failure of test samples shall cause the testing to move further down the seam until the extent of faulty seam has been determined
2. All acceptable repaired seams shall be bound by two conservative passing locations on each side of the original sample. In cases where repaired seam exceeds 150-ft, a sample taken from the zone in which the seam has been repaired must pass destructive testing. Repairs shall be made in accordance with Paragraph 3.07G.
3. The Engineer's Field Representative shall document all actions taken in conjunction with destructive test failures.

G. Repair Procedures

1. Any portion of the geomembrane exhibiting signs of defect, failing a destructive or a nondestructive test, shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be made by the Engineer.
2. The repair procedures available include:
 - a. Patching, used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
 - b. Spot welding or seaming, used to repair small tears, pinholes, or other minor, localized defects.
 - c. Capping, used to repair large lengths of failed seams.
 - d. Removing bad seam and replacing with a strip of new material welded in place.
 - e. For small lengths of failed seam (less than 3 feet), extrusion welding can be used to repair provided there is sufficient overlap between the two geomembrane panels.
3. For any repair method, the following provisions shall be satisfied:
 - a. Surfaces of the geomembrane which are to be repaired using extrusion methods shall be abraded no more than one hour prior to the repair.
 - b. All surfaces shall be clean and dry at the time of the repair.
 - c. All seaming equipment used in repairing procedures shall be qualified.
 - d. All patches and caps shall extend at least 4-in beyond the edge of the defect.
 - e. All patches shall have rounded corners

H. Repair Verification

1. Each repair shall be numbered and logged by the installer. Each repair shall be nondestructively tested using the methods described in Paragraph 3.06 as appropriate. Repairs, which pass the nondestructive test, shall be taken as an indication of an adequate repair. Repairs more than 150 feet long may be of sufficient length to require destructive test sampling, at the discretion of the Engineer. Failed test of the repaired section indicates that the repair shall be redone and retested until a passing test results are achieved. The EFR shall observe all nondestructive testing of repairs. The installer shall record the number of each repair, date and test outcome.

I. Wrinkles

1. Large wrinkles that remain in the sheet as result of temperature expansion or uneven surface preparation may need removal as determined by the EFR in consideration of applied loads on the wrinkle. Should the wrinkle need removing, the lower down-slope edge of the wrinkle shall be cut, overlapped and repaired as described in Paragraph 3.07G. Both ends of the wrinkle repair shall be patched. Caution must be taken in removing any wrinkles. Wrinkles are needed to allow for future contraction of the geomembrane, especially in cold weather.

J. Construction Equipment

1. Construction equipment or vehicles with steel tracks shall not be permitted on the geomembrane. Other equipment such as portable generators and power centers shall be permitted if the support apparatus is protected from damaging the geomembrane, and if care is taken to prevent leaking lubricants from damaging the geomembrane

3.08 ELECTRIC CONDUCTIVITY TESTING

- A. Following installation of the 24-inch minimum protective cover layer, the Contractor shall provide and pay for electrical leak location survey to ensure that no puncturing of the geomembrane occurred during installation using ASTM D8265. The Contractor will fully cooperate with the testing including providing survey service and laborers to establish testing points and vacating areas designated by the testers.
- B. All leaks located by the survey shall be repaired at no additional cost to the Owner. Following completion of all repairs, at no additional cost to the Owner, the repairs shall be verified by additional electrical leak location survey. This process shall be performed until all repairs have been deemed acceptable.
- C. The Contractor shall submit a plan prior to performing the work that describes the methods to be employed and demonstrates equivalency to the requirements specified herein. The results of the leak location survey shall be communicated to the Engineer before the leak location survey crew leaves the site. Contractor shall submit two (2) copies of the certified test results documenting the electrical leak location surveys within 14 days of the completion of each leak survey. The reports shall document the methodology used, the locations and descriptions of the leaks, and a diagram of the facility showing the approximate leak locations.
- D. The Contractor is required to provide site preparation to support for the electrical leak location survey:
 1. Contractor shall ensure that the material covering the geomembrane in the survey area contains moisture in order to provide sufficient electrical conductivity. It is critical that the Contractor add as much moisture as practical to the cover material during material placement, since inadequate moisture directly above the geomembrane may prevent the detection of leaks.

2. Contractor shall provide a means of watering the surface of the survey area for the duration of the survey. In addition to moisture content of material covering the geomembrane which the Contractor must add during material placement, water may be added to the surface of the material during testing to address surface desiccation that prevents good electrical contact with the measurement probes. The requirement for additional surface moisture is determined during the initial functionality testing before beginning the survey.
3. Contractor shall isolate the material covering the geomembrane in the survey area. The material covering the geomembrane must be isolated from the surrounding soil outside of the survey area and any grounded objects inside of the survey area. This is typically achieved by leaving a strip of geomembrane exposed along the entire perimeter of the survey area. Any access roads used to place cover material must be removed before performing the survey, or a geomembrane rub sheet can be used to bisect the road for electrical isolation while maintaining truck access. It is advisable that the Contractor place a rub sheet at the location of any access roads regardless before placement of cover material in order to facilitate removal for the electrical survey. Any inlet and outlet structures that are grounded (penetrating through the geomembrane) must not be allowed to touch the cover material in the survey area. The cover material can be placed just short of such features.
4. An electrically conductive layer must be present underneath the geomembrane being tested. Examples of electrically conductive material include geosynthetic clay liners with adequate moisture, earth materials with adequate moisture, and most liquids. For the groundwater monitoring sections, which include a secondary geomembrane, a permanent electrode must be installed underneath the primary GCL.

3.09 DISPOSAL OF WASTE MATERIAL

- A. Upon completion of installation, the Contractor shall properly remove and dispose of all trash, waste material and equipment used in connection with the performed work and shall leave the premises in a neat and acceptable condition.

3.10 AS-BUILT DRAWINGS

- A. The Installer shall prepare and submit to the Engineer an as-built drawing reflecting the actual installation of geomembrane, including the location of all seams, the location of destructive samples, and the location of all repair work. The as-built drawing shall be submitted to the Engineer within 14 days of job completion. In addition, a copy of the complete documentation package will accompany the as-built drawing.

END OF SECTION 02776

APPENDIX A

The following forms are included and shall be completed by the responsible party as shown on the forms.

<u>Form No.</u>	<u>Title</u>
CQC - 100	Geomembrane Project QC Log
CQC - 101	Receiving QC Log
CQC - 102	Personnel QC Log
CQC - 103	Daily QC Report Pre-weld Testing
CQC - 104	HDPE Geomembrane Installation Tracking Log
CQC - 105	Seaming Log
CQC - 106	Patch Placement Log
CQC - 107	Destructive Test Log
CQC - 108	Damage and/or Failure Report
CQC - 109	Protective Cover Daily Report

FORM CQC - 100
GEOMEMBRANE PROJECT QC LOG
(one sheet per project)

PROJECT

NAME: _____

NUMBER: _____

LOCATION: _____

OWNER: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

ENGINEERING

ENGINEERING FIRM: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

CONTRACTOR

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

SUPPLIER OF GEOMEMBRANE MATERIALS

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

QC INSPECTION

NAME: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

TESTING LABORATORY

GEOMEMBRANE TESTING LABORATORY: _____

ADDRESS: _____

CONTACT: _____ PHONE: _____

FORM CQC - 100
GEOMEMBRANE PROJECT QC LOG
(one sheet per project)
(Continued)

FABRICATOR OF MATERIAL

NAME: _____

ADDRESS: _____

CONTACT: _____

INSTALLER OF MATERIAL

NAME: _____

ADDRESS: _____

CONTACT: _____

GEOMEMBRANE MATERIALS

SPECIFIED GEOMEMBRANE MATERIALS: _____

THICKNESS & TYPE: _____

MATERIAL CERTIFICATION

MATERIAL CERTIFICATION RECEIVED: _____

DATE: _____ ACCEPTED: _____

FORM CQC - 101
RECEIVING QC LOG
(one sheet per truck)

PROJECT NAME: _____

DATE: _____ TIME: _____ PROJECT NUMBER: _____

TRUCKERS ID: _____

NO. OF PIECES ON BOARD: _____ AGREE WITH PACKING LIST? _____

CONDITION OF PACKAGING: _____

VERIFY PROPER MATERIALS: _____ VERIFY PROPER THICKNESS: _____

IDENTIFY ROLL NUMBERS: _____

IDENTIFY ACCESSORIES (*adhesive, battens, boots, etc.*): _____

IDENTIFY DAMAGED ITEMS: _____

TYPE OF UNLOADING EQUIPMENT USED: _____

OPERATOR: _____

COMMENTS: _____

STORAGE AREA

CONDITION (*surface*): _____

LOCATION TO PLACEMENT AREA: _____

MATERIAL PROPERLY COVERED: _____

WEATHER

CONDITIONS: _____ TEMP: _____

SIGNATURES

QC INSPECTOR: _____

SITE SUPERVISOR: _____

Use back for other comments

FORM CQC - 102
PERSONNEL QC LOG
(installation & field seaming personnel)
(complete for each mobilization or change of personnel)

PROJECT NAME: _____

DATE: _____ PROJECT NUMBER: _____

SAFETY MEETING CONDUCTED ON MATERIALS HANDLING: _____

GIVEN BY: _____ DATE: _____

SUPERINTENDENT OF INSTALLATION: _____

SEAMING CREW PERSONNEL

#1 CREW LEADER: _____ HELPER: _____

#2 CREW LEADER: _____ HELPER: _____

#3 CREW LEADER: _____ HELPER: _____

#4 CREW LEADER: _____ HELPER: _____

#5 CREW LEADER: _____ HELPER: _____

#6 CREW LEADER: _____ HELPER: _____

#7 CREW LEADER: _____ HELPER: _____

#8 CREW LEADER: _____ HELPER: _____

OTHER CREW MEMBERS

NAME: _____ NAME: _____

NAME: _____ NAME: _____

NAME: _____ NAME: _____

SIGNED: _____

QC Inspector

FORM CQC - 103
DAILY QC REPORT
PRE-WELD TESTING

DATE: _____ JOB NAME: _____ JOB NO.: _____ MATERIAL: _____

[illegible]

FORM CQC - 104
HDPE GEOMEMBRANE INSTALLATION TRACKING LOG

[illegible]

FORM CQC - 105
SEAMING LOG
(one sheet per day)

DATE: _____ JOB NAME: _____ JOB NO.: _____ MATERIAL: _____

AMBIENT TEMP.: AM PM WIND: AM PM WEATHER: AM PM

[illegible]

COMMENTS: _____

DAILY TOTALS: Geomembrane _____ sq. ft., Length Seamed _____ ft., No. Destructs marked _____ Anchor Trench: Dug _____
Accepted _____

FORM CQC - 106
PATCH PLACEMENT LOG
(one sheet per day)

DATE: _____ JOB NAME: _____ JOB NO.: _____ MATERIAL: _____

AMBIENT TEMP.: _____ AM _____ PM _____ WIND: _____ AM _____ PM _____ WEATHER: _____ AM _____ PM _____

			INSTALLATION			EXTRUSION WELD		
TIME	PATCH NO.	DESCRIPTION LOCATION	TECH.	MACH ID. NO.	MACH. TEMP.	VAC. TEST Y/N	PASS/ FAIL	COMMENTS

COMMENTS: _____

DAILY TOTALS: Geomembrane _____ sq. ft., Length Seamed _____ ft., No. Destructs marked _____ Anchor Trench: Dug _____

Accepted _____

FORM CQC - 107
DESTRUCTIVE TEST LOG

JOB NAME: _____ JOB NO.: _____ MATERIAL: _____

[illegible]

FORM CQC - 108
DAMAGE AND/OR FAILURE REPORT

JOB NAME: _____ JOB NO.: _____ PAGE: _____

DATE	PANEL NO.	SEAM NO.	LOCATION OF DAMAGE	TYPE OF DAMAGE OR FAILURE	TYPE OF REPAIR	NEW SEAM NO.	NEW PATCH NO.

COMMENTS: _____

FORM CQC - 109
PROTECTIVE COVER
DAILY REPORT

DATE: _____ JOB NAME: _____ JOB NUMBER: _____

[illegible]

SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to do the miscellaneous work not specified in other sections but obviously necessary for the proper completion of the work as shown on the Drawings.
- B. When applicable the Contractor shall perform the work in accordance with other sections of this Specification. When no applicable specification exists the Contractor shall perform the work in accordance with the best modern practice and/or as directed by the Engineer.
- C. The work of this Section includes, but is not limited to, the following:
 - 1. Construction and maintenance of any temporary access roads and any necessary drainage, erosion, or sedimentation control structures or measures.
 - 2. Crossing and relocating existing utilities.
 - 3. Restoring of existing roadways and pavements.
 - 4. Cleaning up.
 - 5. Incidental work.
 - 6. Job photographs and video (pre-construction and progress photographs)
 - 7. Traffic control.
 - 8. Protection and/or removal and reinstallation of signs, lampposts and mailboxes.
 - 9. Protection and bracing of utility poles.
 - 10. Restoring easement and right-of-ways.
 - 11. Temporary facilities.
 - 12. Construction schedules.
 - 13. Project surveying.
 - 14. Waste, liner limits and other markers.

15. Record Documents. (Shop Drawings, Specifications, O&M Manuals, Warranties and Record Drawings)

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials required for this Section shall be the same quality of materials that are to be restored. Where possible, the Contractor may re-use existing materials that are removed if approved by Engineer.

PART 3 EXECUTION

3.01 CROSSING AND RELOCATING EXISTING UTILITIES

- A. This item includes work required in crossing culverts, water courses, including brooks and drainage ditches, storm drains, gas mains, water mains, electric, telephone, gas and water services and other utilities. This work shall include but is not limited to the following: bracing, hand excavation and backfill (except screened gravel) and any other work required for crossing the utility or obstruction not included for payment in other items of this specification.
- B. In locations where existing utilities cannot be crossed without interfering with the construction of the work as shown on the Drawings, the Contractor shall remove and relocate the utility as directed by the Engineer or cooperate with the Utility Companies concerned if they relocate their own utility.
- C. At pipe crossings and where designated by the Engineer, the Contractor shall furnish and place screened gravel bedding so that the existing utility or pipe is firmly supported for its entire exposed length. The bedding shall extend to the mid-diameter of the pipe crossed.

3.02 RESTORING OF ROADWAYS

- A. Existing roadways disturbed by the construction shall be replaced. Paved drives shall be repaved to the limits and thicknesses existing prior to construction. Gravel drives shall be replaced and regraded.

3.03 CLEANING UP

- A. The Contractor shall remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall restore the site of the work to a neat and orderly condition.

3.04 INCIDENTAL WORK

- A. Do all incidental work not otherwise specified, but obviously necessary to the proper completion of the Contract as specified and as shown on the Drawings.

3.05 TEMPORARY FACILITIES

- A. The Contractor shall furnish, install, maintain and remove all temporary facilities required for construction or called for in the specifications.

END OF SECTION 02901

SECTION 02985

SEEDING AND MULCHING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary to finish grade, seed, fertilize, mulch, and maintain all seeded areas as specified herein including all areas disturbed by the Contractor's operations.

1.02 REFERENCES

- A. North Carolina Department of Environmental Quality, Erosion and Sediment Control Planning and Design Manual.

1.03 SUBMITTALS

- A. Submit to the Engineer for review complete shop drawings for all materials and equipment furnished under this Section, including seed mixtures and product label information.
- B. Samples of all materials shall be submitted for inspection and acceptance upon Engineer's request.
- C. If applicable, any soil test results and fertilizer and soil amendment recommendations from the North Carolina Department of Agriculture and Consumer Affairs or a similar soil and nutrient testing laboratory.
- D. The Contractor shall submit a certified survey in accordance with Section 01050.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil shall be placed only as needed to provide an adequate seed bed. Topsoil shall be excavated from the site, imported, and/or a blend of both. Shall be generally free of weeds, roots, and other material foreign materials that could prevent seed germination.
- B. Fertilizer shall be complete commercial starter fertilizer, 10-10-10 grade, or approved alternate. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing.
- C. Lime shall be ground limestone containing not less than 85 percent calcium and magnesium carbonates. Liquid lime will not be an acceptable substitute for agricultural lime.

- D. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85, and shall have not more than one percent weed content.
- E. Seed mix shall be furnished and delivered premixed in the proportions specified in Paragraph 3.02 E. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturer for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
- F. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.
- G. Mulch shall be clean small-grain straw.

PART 3 EXECUTION

3.01 APPLICATION

- A. Lime shall be applied at the rate of 2,000 lbs per acre.
- B. Fertilizer shall be applied at the rate of 1,000 pounds per acre.

3.02 INSTALLATION

- A. Seed all disturbed areas of construction outside the landfill disposal unit (excluding roads surfaces) within 21 days of final grade.
- B. No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry.
- C. The subgrade of all areas to be seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed. Eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Changes in grade should be gradual and slopes shall blend into level areas. To help prevent erosion, tracked soil surfaces shall be oriented up and down slopes and not parallel to slopes.
- D. Fertilizer shall be uniformly spread and disked or roto-tilled to a depth of at least 4 inches.
- E. Immediately following preparation, the seed shall be uniformly applied and lightly raked into the surface. Lightly roll the surface and water with fine spray. Temporary and Permanent Seed mix are shown on the Drawings and shall be applied per rates shown on Drawings.
- F. All seeded areas shall be mulched with clean small-grain straw at a rate of 1-1/2 to 2 tons per acre. Hydro Mulch Tack shall be applied uniformly at a rate of 700 gallons per acre to tack the mulch, unless otherwise shown on the plans. Mechanical tacking will be considered on a case-by-case basis as approved by the Engineer.

- G. The Contractor shall keep all seeded areas watered and in good condition. Reseeding shall be done if and when necessary until a good, healthy, uniform growth is established over the entire area seeded.
- H. On slopes, the Contractor shall provide against washouts by an approved method. Any washout which occurs shall be regraded and reseeded at the Contractor's expense until good sod is established.
- I. Temporary Seeding shall be performed as necessary to comply with all applicable regulations, the sedimentation and erosion control plan and applicable permits. Contractor shall use a seed mix that is suitable for the growing conditions that are encountered and shall apply fertilizer, lime and mulch as required to temporarily stabilize disturbed areas.

3.03 MAINTENANCE

- A. The Contractor shall maintain all seeded areas in a condition approved by the Engineer until readiness for final payment. Maintenance shall include, but not be limited to, mowing, raking clippings and leaves, repair of seeded areas, irrigation, and weed control. Protection shall be provided for all seeded areas against trespassing and damage. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly.
- B. Mowing shall be scheduled so as to maintain a minimum stand height of 4 inches. Stand height shall be allowed to reach 7 to 9 inches prior to mowing.
- C. All seeded areas shall be inspected on a regular basis and any necessary repairs or reseeding made within the planting season, if possible.

END OF SECTION 02985

DIVISION 11

EQUIPMENT

SECTION 11323

SUBMERSIBLE RISER PUMPS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The installation shall, at a minimum, consist of submersible pumps and controls, flowmeters, discharge piping and all appurtenances as shown on the Drawings and as specified herein.
- B. One complete system will be supplied for the Cell 7 leachate collection system and a spare pump will be supplied. Thus, two pumps will be supplied. The pump will pump landfill leachate into a flexible pipe and solid HDPE pipe force main, to the leachate storage basin. Electrical leads and connections are specified in Division 26.
- C. One complete system will be supplied for the Cell 7 stormwater segregation system. The pump will pump stormwater into a flexible pipe and solid HDPE pipe force main to a perimeter channel. Electrical leads and connections are specified in Division 26.

1.02 RELATED WORK

- A. The following shall be submitted in accordance with Section 01300:
 - 1. Shop and erection drawings showing all important details and dimensions.
 - 2. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, which show that they meet the specified requirement for total head, capacity, efficiency, NPSHR, submergence and horsepower. Curves shall be submitted on 8½-inch x 11-inch sheets, at an adequate scale. Curves shall be plotted from zero flow at Shut Off Head to Pump Capacity at minimum specified total head.
 - 4. Approximate total weight of the equipment including the weight of the single largest item.
 - 5. Drawings showing the layout of the Control Panels. The layout shall show front and side elevations and shall indicate every device mounted on the inner door and subpanel with complete identification.
 - 6. Complete wiring diagrams and schematics of all power and control systems showing wiring requirements between all system components, motors, sensors, control panels and related systems.
 - 7. A complete list of the equipment ordered.
 - 8. Manufacturer/supplier warranty.

B. In the event that it is impossible to conform with certain details of the Specifications due to different manufacturing techniques, the submittal shall describe completely all nonconforming aspects.

C. Operating and Maintenance Data.

1. Operating and Maintenance Manuals shall be furnished. The manuals shall be prepared specifically for equipment furnished and installed and shall include all required cross sections, drawings, equipment lists, description, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment.
2. A factory representative, who has complete knowledge of proper operation and maintenance, shall be provided for two day to instruct representatives of the Owner on proper operation and maintenance.

1.03 QUALITY ASSURANCE

- A. To assure unity of responsibility, the pumps, control panels and other auxiliary equipment and materials specified in this Section shall be furnished and coordinated by the pump manufacturer. The Contractor and manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system including pumps and controls as specified.
- B. The submersible pumps and other equipment covered by these Specifications are intended to be standard design and proven ability. The pumps shall be designed for side slope riser liquid removal. The pumps shall be equipped with level sensing systems and wheels for ease of installation. The furnished pumps shall be designed, constructed and installed in accordance with the Hydraulic Institute Standards and shall operate satisfactorily when installed.
- C. The control systems shall have an established record of successful performance for similar service.
- D. All equipment furnished under this Specification shall be new and unused, shall be the standard product of manufacturer having a successful record of manufacturing and serving the equipment and systems specified herein for a minimum of three years.
- E. The pumps furnished under this Specification shall be new and unused, shall be the standard product of a manufacturer having a successful record of manufacturing and serving the equipment and system specified herein for a minimum of five years.

1.04 DELIVERY, STORAGE AND HANDLING

- A. All equipment and parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is complete and the units and equipment are ready for operation.

- B. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- C. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.
- D. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
- E. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.05 WARRANTY REQUIREMENTS

- A. All equipment supplied under this section shall be warranted for a period of two years by the Contractor and the equipment manufacturers. Warranty period shall commence in the date of Substantial Completion.
- B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail due to manufacturing defects during the warranty period, it shall be replaced and the unit(s) shall be restored to service at no additional cost to the Owner.
- C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision shall be allowed.

1.06 ADDITIONAL WARRANTY REQUIREMENTS

- A. Pumps
 - 1. The warranty shall cover defects in workmanship and materials and cover all costs for both labor and parts required to inspect and repair pumping equipment delivered to the pump manufacturer's authorized repair and maintenance service center. During the two years warranty period, the Contractor shall be responsible for removing and reinstalling the pumping equipment. The Contractor shall be responsible for all transportation and shipping costs for delivery of the pumping equipment to the service center and return to the site.
- B. Control Peaks
 - 1. Control panels shall be provided with a warranty covering 100 percent of the cost for repair or replacement of defective equipment concurrent with warranty period for pumps, to include all equipment associated with pumps, level transmitters, and/or flow meters.
 - 2. Warranty service to inspect defects in the control panels shall be performed at the pump station site by the Contractor and/or the pump manufacturer/supplier. Repair and/or replacement of defective components to the greatest extent possible shall be performed at the project site; however, no major component, whose removal will render the equipment

or pump stations inoperable, shall be removed without providing a spare of “loaner” replacement component for use and operation of the pump station while the original component is being repaired.

C. AGREEMENT TO WARRANTY CONDITIONS

1. The pump manufacturer/supplier shall, as a part of the required shop drawing and product submittal data, deliver a certified statement of agreement and materials to be supplied and installed under this Section.
2. Operating and Maintenance Data, a typewritten or printed copy of the product warranties, including the above provisions and applicable dates of commencement and expiration of each warranty period, shall be supplied with other required product data.

1.07 PATENTS AND LICENSES

- A. The pumping equipment manufacturer shall be responsible for all patents or licenses that exist for the equipment provided.
- B. The manufacturer shall assume all costs of patent fees or licenses for the equipment or process and shall safe-guard and save harmless the Owner from all damages, judgments, claims and expenses arising from licenses fees, or claimed infringement of any letters, patent or patent rights, or fees for the use of any equipment of process, structural feature or arrangement of any of the component parts of the installation and the price bid shall be deemed to include payment of all such patent fees, licenses or other costs pertaining thereto.

PART 2 PRODUCTS

2.01 PRODUCTS

- A. The manufacturer shall submit a data sheet specific to each pump supplied, the data sheet shall have the name of the manufacturer, the rated capacity, total head, speed and all other pertinent data.

2.02 PUMPING SYSTEM - GENERAL

- A. The pumps shall be totally submersible multi-stage, centrifugal pumps with submersible close coupled motors designed to pump landfill leachate. The pumps shall be automatically connected to the discharge connection when lowered into place utilizing a quick connect and shall be easily removed for inspection or service manufactured by EPG Companies, Inc. (model EPG SurePump 30-3, 7.5 Hp, 50 to 200 GPM, 60 Hz).
- B. For the leachate collection system, the pump controls shall be set as follows:

- | | Inches above level sensor |
|------------|---------------------------|
| • Pump On | 7.6 |
| • Pump Off | 4.4 |

C. For the stormwater segregation system, the pump controls shall be set as follows:

	Inches above level sensor
• Pump On	12
• Pump Off	6

2.03 PUMP CONSTRUCTION

A. The materials of pump construction shall be as follows:

Impeller	304 Stainless Steel
Impeller Seal Ring	Teflon®
Motor Adapter	304 Stainless Steel
Inlet Screen	304 Stainless Steel
Pump Shaft	304 Stainless Steel
Coupling	329 Stainless Steel
Check Valve Housing	304 Stainless Steel
Check Valve	304 Stainless Steel
Check Valve Seat	E Glide
Diffuser Chamber	304 Stainless Steel
Fasteners	304 Stainless Steel
Bearing	Teflon® or E Glide
Suspension Cables	304 Stainless Steel

2.04 SUBMERSIBLE MOTORS

A. Motors shall be 4-inch, high thrust, corrosion-resistant motors as manufactured by Franklin Electric or equal having the following characteristics:

1. Thrust Rating: 1500 pounds downthrust continuous, 100 pounds upthrust intermittent.
2. Temperature and Time Rating: Continuous duty with 0.25 ft/sec. flow past motor. Temperature 30°C ambient.
3. Enclosure: Hermetically sealed windings, corrosion-resistant materials. Filtered check valve plugged to prevent interchange with pumped fluids. Stainless steel, splined shaft.
4. Bearings: Radial sleeve bearings, kingsbury type thrust bearings.
5. Lubrication: Water based
6. Overload Protection: Standard three phase magnetic starter with special ambient compensated quick trip overload relays in all three legs required for positive motor protection.
7. Motors shall be designed for operation in severe environments.
8. Motors shall be constructed of 316 stainless steel.

9. Motors shall be rated 460V, 3 phase, 60 Hz.

- B. Motors shall comply with all requirements of Division 26 of these specifications.
- C. The pumps shall be supplied with power and sensor conductors. Pump motor cables shall be sized to meet applicable NEC requirements. The cable entry system shall be field serviceable. Any cable entry system requiring epoxy silicones or other secondary sealing systems shall not be acceptable.
- D. Pump electrical cables shall be provided of sufficient length so that the cables will be continuous between the pump and the control panel with no splices being allowed. The motor cable shall be of the MSHA type insulated cable with a double jacketed protection system, neoprene outside, synthetic rubber inside, exceeding industry standards for oil, gas, and sewerage resistance.

2.05 PUMP CONTROL SYSTEM

A. General

1. One pump controller shall be provided for each submersible riser pump station located in a common enclosure. The controller shall respond to the liquid level sensor to automatically start and stop pumps to remove leachate/stormwater in response to changes in liquid levels.
2. The pump controller shall be the standard system of the manufacturer as modified for this application.
3. Provide four 20-amp, one pole circuit breakers for miscellaneous 120-volt equipment (i.e., heat trace, flow transmitter, etc.) with CPT sized for all equipment.
4. Provide control panel with lightning and surge protection.
5. Electric power to be furnished to the panel shall be 480 volts, three phases, 60Hz and shall be furnished via the service panel as shown on the drawings and specified in Division 26.

B. Operation Requirements

1. The control panels shall consist of a main circuit breaker, a motor circuit protector and magnetic starter for the pump motor, and a 120-volt control power transformer (fused) on primary and secondary pump controller and circuit breakers as required. A high-level alarm and pump shut-off shall be accomplished by the control system with all control components mounted in one common enclosure. Control switches shall provide means to operate the pump manually or automatically.
2. The manufacturer shall provide a complete and fully functional control system to manually and automatically operate the pumps as specified herein and in other applicable sections of these specifications. All manufacturer's recommended safety devices shall be furnished to

protect operators. All control devices, unless specified otherwise, shall be mounted in the control panel.

3. Normally open dry contacts shall be provided on high alarm, failure alarm and normal run indicators for remote use.
4. A pressure sensor type liquid level control system shall continuously monitor liquid level and control operation of the pump. The pressure transmitter level sensor shall have a range of 0 to 23-ft. or 0-10 psi with a 4 to 20 MA output signal and shall be accurate to within 0.1-inch. A digital display located in the control panel shall continuously indicate the liquid level.

C. Construction

1. The electrical control equipment shall be mounted within a NEMA 4X dead front enclosure constructed of not less than 14-gauge 316 stainless steel and shall be equipped with a quarter-turn quick release latch with all exterior components constructed of 316 stainless steel. The enclosure shall be equipped with an inner door and shall incorporate a removable back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Door(s) shall be interlocked with main circuit breaker and provided with pad-locking provision.
2. Components
 - a. All motor branch circuit breakers, motor starters and control relays shall be of highest industrial quality, securely fastened to the removable back panels with screws and lock washers. Back panels shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.
 - b. A thermal-magnetic air circuit breaker, Type FH as manufactured by Square D Company, or equal, shall be furnished for each pump motor and main breaker. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering. Each circuit breakers shall be adequately sized to meet the pump motor and station operating conditions. A motor circuit protector (MCP) shall be provided for each pump motor. MCPs shall be molded case with adjustable magnetic trip only, "MagGard" as manufactured by Square D Company or equal.
 - c. A mechanical disconnect mechanism shall be installed on each circuit breaker to provide a means of disconnecting power to the pump motors.
 - d. An open frame, across-the-line, NEMA-rated, magnetic motor/starter, Class 8536 as manufactured by Square D Company, or equal, shall be furnished for each pump motor. All motor starters shall be provided with motor circuit protectors and equipped to provide under-voltage release and overload protection on all three phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position. Overloads shall be of the melting alloy or bi-metallic type, adjustable overloads are not acceptable, class 10 quick trip overloads shall be provided for all submersible motors. Overload reset push-buttons

shall be located on the exterior of the door. Normally open and normally closed auxiliary motor overload contacts wired to terminal blocks shall be provided for each motor starter within the control panel.

- e. A phase monitor shall be provided for the control panel, phase monitors shall be Diversified Electronics Model No. SUA-440-ASA.
- f. A duplex GFCI utility receptacle (circuit breaker protected) providing 120 volts, 60 hertz, 20 AMP single phase current shall be mounted on the side of the enclosure.
- g. The control diagrams and overload tables shall be laminated to the inside of the exterior door.
- h. Print storage pockets shall be provided on the inside of each panel. Its size shall be of sufficient size to hold all of the prints required to service the equipment. Reduced drawings shall be provided to be stored in these pockets.
- i. Digital Level Control: The level meter shall be mounted on the inner door. Meter shall have a digital readout and the capacity to monitor and maintain pumping operations, as well as at least two other levels signals. Level control shall be accurate to within 0.1-inch.
- j. Corrosion Inhibitor Emitter: Inclusion of an industrial corrosion inhibitor emitter that shall protect internal components of control panel from corrosion for up to one year. One spare emitter shall be provided for each control panel.
- k. Digital Flow Meter Readout: A digital transmitter with LCD displays, showing both meter flow rate and totalized flow volume, shall be mounted on the inner door as well. The flow totalizer shall be a bi-directional, eight digit (minimum) digital display, resettable, with full capability for front panel programming for ease of field changes and troubleshooting. The system shall operate from a 115-volt, 60 Hz power supply. The meter shall include a non-volatile memory to retain programming choices, presets and count values when power is disconnected, with menu-driven programming. The sensor and transmitter system shall maintain full function in temperature between 0° and 50° C.
- l. A failure alarm with horn and beacon light shall be provided. Silence and reset pushbuttons shall also be furnished. A common failure reset pushbutton shall be provided to reset the alarm conditions (reset shall occur only if fault condition has been cleared). The alarm horn shall be weatherproof rated with gasket (Federal Signal Corporation, Cat. #350 or equal). The alarm beacon shall be NEMA 4x rated, red lense and solid state flashter (Ingran Products Inc. LRX-40).
- m. All exterior mounted equipment shall be NEMA 4X rated. Hinged NEMA 4x 316 stainless steel viewing windows will be permitted where such equipment is not available with a NEMA 4 rating.

- n. The control panel shall be provided with lightning and surge protection. Protection devices shall be mounted within the control panel enclosure. Lead lengths shall not be longer than 12 inches from the main circuit breaker. Protection shall be as manufactured by Advanced Protection Technologies, TE/5000 P or equal.
 - o. A light fixture (circuit breaker protected) and On/Off switch shall be provided to illuminate the interior of the panel during the maintenance.
 - p. All control panel wiring shall be numbered at both ends with type written heat shrinkable wire markers.
 - q. Wiring shall be stranded copper, minimum size #14 AWG (except for shielded instrumentation cable), with 600-volt, 90 degree C, flame retardant, type MTW thermoplastic insulation.
 - r. All foreign voltage control wiring shall be yellow.
 - s. The control panel shall be provided with nameplates identifying each component, selector switches, pilot lights, etc. Nameplates shall be permanently affixed using an epoxy process (inner door nameplates shall be fastened with stainless steel screws). Nameplates shall be laminated plastic, engraved white letters with a black background.
 - t. All control panels shall be provided with a master nameplate located on the exterior door.
 - u. Provide a nameplate which reads as follows: "CAUTION – THIS PANEL CONTAINS A VOLTAGE FROM AN EXTERNAL SOURCE". Letters shall be black on a high visibility yellow background.
 - v. The completed control panel assembly shall U.L. certified.
3. Operating Controls and Instruments
- a. All operating controls and instruments shall be securely mounted on the control compartment door. All controls and instruments shall be clearly labeled to indicate function.
 - b. Pump mode selector switches shall be Hand-Off-Auto type to permit over-ride of automatic level control and manual actuation or shutdown of pump motor. Operation of pumps in manual mode shall bypass all safety shutdown circuits except pump motor overload shutdown. Switches shall be NEMA 4x (800H) as manufactured by Allen Bradley, or equal, providing three switch positions, each of which shall be clearly labeled according to function.
 - c. Indicator lamps shall be Incandescent full voltage type and mounted in NEMA 4x (800 H) modules, as manufactured by Allen Bradley. Lamp modules shall be equipped to operate at 120-volt input. Lamps shall be easily replaceable from the

front of the control compartment door without removing lamp module from its mounted position. Indicators shall be provided for individual motor run and an indicator for each failure condition.

- d. A six-digit non-reset elapsed time meter shall be connected to each motor starter to indicate the total running time of each pump in “hours” and “tenth of hours”. The elapsed time meters shall be Series T50 as manufactured by the ENM Company or equal.
- e. The following spare parts shall be furnished:
 - 1) 1 indicator light assembly
 - 2) 2 control relays to each type furnished
 - 3) 5 fuses of each type furnished
 - 4) 1 set of thermal overloads for each type furnished
 - 5) 1 selector switch of each type furnished

2.06 SHOP PAINTING

- A. Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt and other foreign matter.
- B. Gears, bearing surfaces and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance test.

2.07 DISCHARGE PIPING AND APPURTENANCES

A. Piping and Appurtenances

- 1. The pump discharge piping inside of the leachate pump riser pipe shall be flexible hose chemically compatible with landfill leachate and manufactured of polyvinyl chloride. The diameter shall be 3-inch inside diameter and have a working pressure of at least 150 psi at 104°F. The hose shall be rated for full vacuum. Discharge piping shall be TigerPlex Series S or equal.
- 2. The flexible discharge piping shall include a #123 electro-less nickel-plated brass quick disconnect fitting with Telfon®-coated Buna-N O-ring and stainless steel set screws. Disconnect fitting shall be attached to flexible hose piping via threaded aluminum pipe with barbed hose connection end.
- 3. A paddlewheel type flow meter sensor shall be installed in a special adaptor, mounted within a pipe tee section, located on the pump discharge line between the riser pipe and the access road. The sensor shall be made to fit the tee section on a 3-inch discharge pipe, in the location shown on the drawings. The sensor shall utilize a dual magnet drum design, be constructed of Delvin, Kynar or equal, and shall measure flow range from 1 to 500 gpm with a linearity and repeatability factor of +/- 0.5%.

4. The air release valves, 1-inch, Class 150, shall be installed as shown on the drawings. The valves shall have a cast iron body, cover and baffle, stainless steel float, bronze water diffuser, Viton seat and stainless steel trim. Valves shall be provided with vacuum check to prevent air from re-entering the line. For 3-inch discharge line, orifice size shall be 3/32-inch. Valves shall be suitable for an operating pressure of 150 psi. The fittings shall be suitable for an operating pressure of 150 psi. The fittings shall be threaded. The air release valves shall be Model 22 by Val-Matic Valve and Manufacturing Corporation, Lyons, Illinois, or Apco, Schaumburg, Illinois, Model 50 or equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's instruction and recommendations in the locations shown on the Drawings. Installation shall include furnishing oil and grease for initial operation, if required, in accordance with the manufacturer's recommendations.
- B. The Contractor shall submit a certificate from the equipment manufacturer stating that the equipment is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3.02 INSPECTION AND TESTING

- A. General
 1. The Engineer shall have the right to inspect, test or witness tests of all materials or equipment to be furnished under these Specifications, prior to their shipment from the point of assembly.
 2. The Engineer shall be notified in writing prior to the initial shipment or testing, in ample time so that arrangements can be made for inspection by the Engineer.
 3. The pump manufacturer shall perform the following test on each pump prior to shipment from the factory.
 - a. Megger motor and pump for insulation breaks or moisture.
 - b. Prior to submergence, the pump shall be run and checked for correction rotation.
 - c. Pump shall be run for a minimum of thirty minutes in a submerged condition.
 - d. The pump shall be removed from test tank, meggered immediately for moisture and upper and lower seal unit shall be checked for water intrusion.
 - e. A written certification test report regarding the above test shall be supplied with each pump at the time of shipment.

4. The services of a factory representative shall be furnished for a minimum of one day per pumping station and shall have complete knowledge of proper operation and maintenance to inspect the final installation and supervise the test run of equipment.
5. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.
6. In the event that the equipment does not meet the Final Acceptance Test, the Contractor shall, at his own expense, make such changes and adjustments in the equipment which he deems necessary and shall conduct further tests until full satisfaction is indicated by the Engineer and written certification is received thereof.
7. The Contractor shall supply an adequate volume of water to each pump station location to meet the requirements of this section.
8. All pumps supplied shall be installed and tested, including the backup pump. One pump each for the leachate collection system and stormwater system shall remain operational after the Final Acceptance Tests.

B. PUMP

1. After each pump has been completely installed and working under the direction of the manufacturer, conduct in the presence of the Engineer such tests as are necessary to indicate that the pump conforms to the Specifications. Supply all electrical power, water, labor, equipment and incidentals required to complete the field tests.
2. The Final Acceptance Test shall demonstrate that all items of these Specifications have been met by the equipment as installed and shall include, but not be limited to, the following tests:
 - a. That all units have been properly installed and are in correct alignment.
 - b. That all units operate without overheating or overloading any parts without objectionable vibration.
 - c. That there are no mechanical defects in any of the parts.
 - d. That the pumps can deliver the specified pressure and quantity of landfill leachate.
 - e. That the level sensor and pump control system operates as specified.
 - f. That the flow meter sensor and transmitter system operates and records as specified.
3. If the pump performance does not meet the Specifications, corrective measures shall be taken or the pumps shall be removed and replaced with pumps which satisfy the conditions specified. A 24-hour operating period of the pumps will be required before acceptance.

C. MOTORS

1. The Contractor shall check all motors for correct clearance and alignment in accordance with manufacturer's instructions. The Contractor shall check direction of rotation of all motors and reverse connections if necessary.

END OF SECTION 11323

DIVISION 26

ELECTRICAL

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to the work of this section.

1.2 DESCRIPTION

- A. The work of this section includes the furnishing and installation of all electrical equipment, materials and devices as shown on the electrical drawings and/or as specified herein, including but not limited to:

1. Conduit and Wire
2. Safety Switches and Fuses
3. Panelboards
4. Mini-Power Zone
5. Lighting
6. Wiring Devices

- B. The term "provide" shall mean furnish and install.

- C. Applicable Publications:

1. Where publications are listed in each Section, they form a part of that Section to the extent referenced.
2. When a standard is specified by reference, comply with the requirements and recommendations stated in that standard, except when its requirements are modified by the Contract Documents or applicable codes establish stricter standards.
3. When a code is not specified by reference in a Section, the work of that Section shall comply with applicable codes listed in the General Conditions.
4. The publication date is the publication in effect as of the bid date, except when a specific publication date is specified.
5. Obtain copies of referenced standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.

1.3 QUALITY ASSURANCE

- A. Codes and Standards:

1. The installation of all work under this section shall comply with all applicable codes, laws, standards and regulations. Nothing in the specifications shall be construed to permit deviation from these governing items.
2. Electrical material and equipment shall bear the UL label except where UL does not label such types of material and equipment. Materials, equipment and installation shall meet requirements of applicable codes and standards listed below:

National Electric Code	NEC
National Electrical Safety Code	NESC
Electrical Testing Lab	ETL
Underwriters Laboratories, Inc.	UL
Certified Ballast Manufacturing	CBM
National Electrical Manufacturers Association	NEMA
Illuminating Engineering Society	IES
Institute of Electrical and Electronic Engineers	IEEE
American National Standards Institute	ANSI

B. Qualifications of Workmen:

1. Provide sufficient qualified journeyman electricians who are thoroughly experienced with the materials and methods specified and familiar with the design requirement.
2. At least one qualified journeyman shall be present at all times during the execution of the work.
3. In acceptance or rejection in any portion of the electrical work, no allowance will be made for lack of skill on the part of the workmen.

1.4 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable quality standards for materials, equipment and workmanship, and to provide operable electrical and mechanical systems in every respect.
- B. The drawings are diagrammatic only, intending to show general arrangement and location of system components. Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets and fittings may not be shown, but shall be provided at no change in contract price.
- C. All work shall be accurately laid out and coordinated with other trades to avoid conflicts and to provide maximum accessibility for operation and maintenance.

1.5 SUBMITTALS

- A. Submit shop drawings of the electrical materials to the Designer for review in accordance with the provisions of Division 01 of these specifications.
- B. The following is a list of those items required to be submitted:
 1. Conduit and Wire
 2. Safety Switches and Fuses
 3. Panelboards
 4. Mini-Power Zone
- C. Contractor shall not begin fabrication or work which requires submittals until return of submittals.

1.6 SUBSTITUTIONS

- A. Refer to the appropriate Division 01 Specification for requirements on Substitutions.

1.7 VISIT TO THE SITE

- A. All persons proposing to submit quotations for work in accordance with these plans and specifications are expected to visit the site of the work covered by the plans and specifications and are to familiarize themselves with existing conditions as they affect the work of this section of the specifications. Claims resulting from a failure to visit the site or inspect the existing conditions will not be considered.

1.8 OPERATING AND MAINTENANCE DATA

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
 - 1. Prepare operating and maintenance data as specified in this section and as referenced in the General Conditions and applicable Section of Division 01 General Requirements.
- B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.
- C. Preparation of data shall be done by personnel:
 - 1. Trained and experienced in maintenance and operation of desired products.
 - 2. Familiar with requirements of this Section.
 - 3. Skilled as technical writer to the extent required to communicate essential data.
 - 4. Skilled as draftsman competent to prepare required drawings.
- D. Prepare data in form of an instructional manual for use by Owner's personnel.

1.9 PAINTING

- A. Suitable finish coatings shall be provided under this section of the Specifications on all items of electrical equipment and wiring which are exposed. This shall consist of either an approved factory applied finish or an acceptable finish applied during or after installation. Equipment which is furnished in finishes such as stainless steel or satin aluminum is not to be painted. Exposed equipment and/or wiring in finished areas such as panel covers or surface raceway shall be supplied with factory applied prime coat and shall be professionally painted or enameled as directed to result in a completely coated and attractively finished manner. All such finishing shall be as directed and shall be satisfactory to the Architect/Engineer.
- B. All factory finished steel surfaces; boxes, enclosures, etc., shall be cleaned and retouched or repainted as necessary to provide a rust resistant coating. Where painting or galvanizing is not specifically specified, ferrous devices, bolts, nuts, inserts, etc., shall be galvanized.
- C. All nameplates shall be left unpainted and in a clean condition.

1.10 WIRING AND ELEMENTARY DIAGRAMS

- A. Wiring and elementary diagrams for equipment as shown on the drawings are based on the product of the specified equipment manufacturer and are shown for convenience to aid in estimating the extent of the work involved. The equipment actually installed shall be wired and

connected in accordance with the equipment manufacturer's recommendations and shall conform to details in approved wiring diagrams to be furnished by the equipment manufacturer. All equipment so connected shall be made to operate in a safe, proper and efficient manner. Note that control circuitry is not necessarily shown on the drawings but shall be installed in conduit between the points and devices indicated on the diagrams.

1.11 EQUIPMENT TESTS

- A. An operating test of the complete electrical system shall be made. System shall test free from grounds, shorts and other faults. Connections shall be for positive mechanical and electrical connection and continuity. Equipment shall be demonstrated to operate in accordance with the requirements of the plans and specifications. Contractor shall furnish all personnel and test instruments required. Performance of tests shall be made in the presence of the Owner's representative, where requested.
- B. The following tests shall be performed as a minimum:
 - 1. Control and Distribution Equipment:
 - a. Check the wire terminals, clean connections.
 - b. Check all control switches, alarm devices, indicating instruments for proper operation under normal and simulated abnormal conditions.
 - 2. Phase rotation: The connections of all equipment shall be checked for correct phase rotation.
 - 3. Circuit Breakers: The following tests shall be performed:
 - a. Inspect each circuit breaker.
 - b. Check for loose connections.
 - c. Operate each circuit breaker manually.
 - d. Set the adjustable trips to the values specified.
- C. Spot-checks and/or back-checks to verify the testing accuracy shall be made for the Engineer or his agent during job-site visits.
- D. Validity of the ground path shall be assured by constant and careful attention to the thorough tightening of all couplings, connectors, locknuts, screws, bolts, etc. and by frequent checking of the path resistance with a quality low-range ohmmeter. Resistance of the path should not exceed one ohm between any two points. If a reading in excess of this is observed, it shall be discussed with the Engineer for an appraisal of the condition.
- E. After all fixtures, devices and equipment are installed and all connections completed to each panel – disconnect neutral feeder conductor from neutral bar and take a megger reading between neutral bar and grounded can. If this reading is less than 250,000 ohms, disconnect branch circuit (or sub-feeder) neutral wires from this neutral bar. Test each one separately to the panel can until low reading ones are found. Correct troubles reconnect and retest until at least 250,000 ohms from neutral bar to grounded panel can is achieved with only neutral feeder disconnected. In addition all wiring shall be tested. All phase and neutral conductors shall be tested with a 500 volt megger. Minimum acceptable readings shall be 1,000,000 ohms for conductors #6 awg and smaller; 250,000 ohms for conductors #4 awg and larger. All measurements shall be between the conductor and the grounding conductor.

- F. Upon completion of work, but before final inspection, the Contractor shall send a letter to the engineer and the Owner certifying that these tests have been accomplished and tabulating the megger readings for each panel. During field visits, contractor shall demonstrate installation and make such tests as may be required to satisfy the Designer and Owner that work is installed in accordance with drawings, specifications and instructions.

1.12 WARRANTIES

- A. All equipment installed under this Division of the work shall be warranted for a minimum of one year after project acceptance.
- B. During this warranty period, replace any and all defective equipment and parts at no cost to the Owner.

1.13 BRANCH CIRCUITS

- A. The number of conductors in each run of conduit is indicated on the drawings and where there is a conflict between the number of wires indicated and the actual number required as determined by the functional design requirements, the number of wires determined by the functional design requirements shall govern.
- B. In general, there is a number associated with each branch circuit outlet which identifies the particular branch circuit to which the device served by the outlet is to be connected. The circuit number indicated has been assigned only for reference and guidance, and is not intended to limit panelboard circuitry. All branch circuits shall be connected to breakers in accordance with circuit requirements and good industry practice. The balancing of all loads shall be included in the work of this DIVISION.
- C. Home runs shall not be combined where such would require derating of conductor ampacity. Separate neutrals shall be provided for all branch circuits.

1.14 MOTOR, APPLIANCE AND EQUIPMENT CONNECTIONS

- A. Unless otherwise shown on the drawings or specified herein, it is the intent of this DIVISION to provide all electrical equipment and connections required to protect, properly operate, and control all motors, appliances, electrical devices, and equipment furnished and installed under this and other DIVISIONS of the specifications or shown on the drawings.

1.15 SETTING OF EQUIPMENT

- A. The setting of equipment shall be carefully coordinated with the work and requirements of the other trades involved to ensure compatibility and to avoid conflicts.
- B. Equipment, base mounted on concrete or masonry slabs, pads and piers, or mounted on stands, gratings, platforms, or other, shall not be set in any manner, except on the finished and permanent support.
- C. Support of equipment on studs or by other means, and the placing or building of the supporting slab, pad, pier, stand, grading, or other, "to the equipment", is prohibited.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THW, and THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Specification Section "Firestopping."

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller **except stranded wire shall be provided where wiring is connected to vibrating equipment**; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN-THWN, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type THHN-THWN, single conductors in raceway.
- G. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- H. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements of other sections.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Receptacle circuits.
 - 3. Single-phase motor and appliance branch circuits.
 - 4. Three-phase motor and appliance branch circuits.
 - 5. Flexible raceway runs.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated where required in other sections.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

- A. Product Data: For steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Specification Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Specification Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Specification Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Painting Specification Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. LFMC: Flexible steel conduit with PVC jacket.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- B. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
- B. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. All raceways shall be installed parallel and perpendicular to the structure.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Equipment identification labels.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved phenolic labels, lettering no less than 3/8" high.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 - 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Black surface with white core for 480Y/277 volt equipment
 - b. Blue surface with white core for 208Y/120 volt equipment
 - 2. Equipment to Be Labeled:
 - a. Enclosed circuit breakers and disconnect switches.
 - b. Panelboards
 - c. Mini-Power Zones

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase Identification, 600 V and Less: Per existing site conditions.

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.
- C. Field quality-control reports.
- D. Panelboard schedules for installation in panelboards.
- E. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Outdoor Wet and Damp Locations: NEMA 250, Type 4X Stainless Steel.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Incoming Mains Location: Top and bottom.
- C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Main and Neutral Lugs: Mechanical type.
 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according NEMA PB 1.1.
- B. Mount top of trim 72 inches above finished floor unless otherwise indicated.
- C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- D. Where two or three single pole breakers serve a multi-wire circuit, provided identifying handle ties on those breakers serving the circuit to meet provisions of NEC 210.4 (B).
- E. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform visual tests of all panelboards, cleaning any construction debris before energizing and before final inspection.
 - 2. Check all phases for load balance, balancing all phases to within 20% of each other.
 - 3. Provide thermal scan of all panelboards when they have been operating at maximum load for a minimum of one (1) hour. Record all "hot spots" and make corrections as necessary. Any corrections that cannot be accomplished on site shall be brought to the Designer's attention. Failure of panelboard components shall be rectified by the Contractor and/or panelboard vendor.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection report, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

END OF SECTION 262416

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified third party testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and provided with a defeatable interlock with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 4. Lugs: Suitable for number, size, and conductor material.
 5. Auxiliary Form C contact that changes state based on position of handle.

2.2 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Outdoor Locations: NEMA Type 4X, Stainless Steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Division 16 Section "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection report, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

END OF SECTION 262816

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SECTION 264313 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes TVSSs for low-voltage power, control, and communication equipment.

1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. SVR: Suppressed voltage rating.
- C. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating weights, operating characteristics, furnished specialties, and accessories.
- B. Product Certificates: For transient voltage suppression devices, signed by product manufacturer certifying compliance with the following standards:
 - 1. UL 1283.
 - 2. UL 1449.
- C. Qualification Data: For testing agency.
- D. Field quality-control test reports, including the following:
- E. Test procedures used.
- F. Test results that comply with requirements.
- G. Failed test results and corrective action taken to achieve requirements.
- H. Operation and Maintenance Data: For transient voltage suppression devices to include in emergency, operation, and maintenance manuals.
- I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."
- F. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."
- G. Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, "Transient Voltage Surge Suppressors."

1.6 PROJECT CONDITIONS

- A. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:
 - 1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
 - 2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
 - 3. Humidity: 0 to 85 percent, noncondensing.
 - 4. Altitude: Less than 20,000 feet (6090 m) above sea level.

1.7 COORDINATION

- A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within five years from date of Substantial Completion.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Replaceable Protection Modules: One of each size and type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Advanced Protection Technologies, Inc.
 - 2. Current Technology, Inc.
 - 3. Cutler-Hammer, Inc.; Eaton Corporation.
 - 4. General Electric Company.
 - 5. Innovative Technology, Inc.
 - 6. Leviton Mfg. Company Inc.
 - 7. Siemens Energy & Automation, Inc.
 - 8. Square D; Schneider Electric.
 - 9. Surge Suppression Incorporated.
 - 10. Tycor; Cutler-Hammer, Inc.
 - 11. United Power Corporation.

2.2 SERVICE ENTRANCE SUPPRESSORS

- A. Surge Protection Device Description: Modular design with field-replaceable modules, sine-wave-tracking type with the following features and accessories:
 - 1. Fuses, rated at 200-kA interrupting capacity.
 - 2. Fabrication using bolted compression lugs for internal wiring.
 - 3. Integral disconnect switch.
 - 4. Redundant suppression circuits.
 - 5. Redundant replaceable modules.
 - 6. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
 - 7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 - 8. LED indicator lights for power and protection status.
 - 9. Audible alarm, with silencing switch, to indicate when protection has failed.

10. One set of dry contacts rated at 5 A and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
 11. Surge-event operations counter.
- B. Peak Single-Impulse Surge Current Rating: 320 kA per phase.
- C. Connection Means: Permanently wired.
- D. Protection modes and UL 1449 SVR for grounded wye circuits with voltages of 208Y/120, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 400 V for 208Y/120.
 2. Line to Ground: 400 V for 208Y/120.
 3. Neutral to Ground: 400 V for 208Y/120.

2.3 ENCLOSURES

- A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

- A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.
- B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
1. Provide multipole, 60-A circuit breaker as a dedicated disconnect for suppressor, unless otherwise indicated.

3.2 PLACING SYSTEM INTO SERVICE

- A. Do not energize or connect service entrance equipment to their sources until surge protection devices are installed and connected.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust equipment installation, including connections, and to assist in field testing. Report results in writing.
1. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

- B. Testing: Perform the following field tests and inspections and prepare test reports:
 - 1. After installing surge protection devices, but before electrical circuitry has been energized, test for compliance with requirements.
 - 2. Complete startup checks according to manufacturer's written instructions.
 - 3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
- C. Remove and replace malfunctioning units and retest as specified above.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transient voltage suppression devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 264313

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