BIDDING DOCUMENTS

FRANCIS FARM LANDFILL
RESTRICTIVE COVER IMPLEMENTATION PLAN

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA

mcgill

Shaping
Communities
Together

BIDDING DOCUMENTS

FRANCIS FARM LANDFILL
RESTRICTIVE COVER IMPLEMENTATION PLAN

HAYWOOD COUNTY

HAYWOOD COUNTY, NORTH CAROLINA

MARK D. CATHEY, PE

mcgill

55 Broad Street
Asheville, NC 28801
828-252-0575
Firm License No.: C-0459

NORTH CAROLINA PROFESSIONAL SEAL 24993 ENGINEER MARK D. CATHEY

Mark D. Cathey

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PROJECT NO. 14.00708

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INVITATION TO BID
Francis Farm Landfill
Restrictive Cover Implementation Plan
Haywood County, North Carolina

Sealed bids for the project entitled **Francis Farm Landfill, Restrictive Cover Implementation Plan** will be received by **Haywood County** until **2:00 P.M**. local time **February 4, 2020** in the **Haywood County Historic Courthouse Meeting Room** located at **215 North Main Street, Waynesville, North Carolina 28786.** At said place and time, all Bids that have been duly received, will be publicly opened and read aloud.

A mandatory pre-bid conference for pre-qualified bidders only will be held at the **Francis Farm Landfill** in the Haywood County Administration, Maintenance, and Bus Garage Facility at 176 Farmview Road, Waynesville, North Carolina, 28786 on January 14, 2020 at 10:00 a.m. All bidders must attend this meeting to review the plans, ask for additional information or clarification and to visit the project site.

THE PROJECT GENERALLY CONSISTS OF the construction of a 20-acre LLDPE landfill cap, including approximately 200,000 cubic yards of earthwork, paved access road construction, installation of an arched culvert over a stream, installation of landfill gas (LFG) and leachate collection piping, raising existing LFG extraction wellheads, installation of a sewerage pump station and force main, stormwater piping, and erosion control measures.

Digital copies of the Bid Documents are available for purchase at www.mcgillassociates.com at no cost. These documents may be downloaded by entering **Quest Project Number 6622778** in the search bar and the password **1400708**. **For assistance and free membership, contact Quest CDN at (952) 233-1632 or info@questcdn.com**.

The successful bidder shall be required to furnish separate, 100 percent Performance and Payment Bonds in compliance with North Carolina General Statutes Chapter 44A Section 143-129, and with Article 3 of Chapter 44A of the North Carolina General Statutes. The Performance Bond shall be in full force and effect for one (1) year after the date of final acceptance of the project by the Owner.

Each bid shall be accompanied with a cash deposit or certified check drawn on a bank or trust company insured by the FDIC or a Bid Bond prepared on the form of Bid Bond contained in the Bidding Documents or a Surety Company's standard form and properly executed by a corporate surety licensed under the laws of North Carolina to execute such bonds. The amount of the bid bond shall be equal to **five (5) percent** of the total of the bid. The bid deposit shall be retained by the Owner if the successful bidder fails to execute the contract or fails to provide the required bonds, as stated above, within ten (10) days after the proper notice of award of the contract.

The Owner reserves the right to reject any and all Bids, to waive informalities, or to reject non-conforming, non-responsive, or conditional bids. The Owner reserves the right to award a contract to the lowest, responsive, responsible bidder or bidders, taking into consideration quality, performance and time.

Bidders must comply with the President's Executive Order No. 11246 as amended, which prohibits discrimination in employment regarding race, creed, color, sex or national origin. Bidders must

comply with Title VI of the Civil Rights Act of 1964, the Davis-Bacon Act, the Anti-Kickback Act, the Contract Work Hours Standard Act, and 40 CFR 33.1016, and 40 CFR 60-4.

Bidders must comply with the requirements of the State of North Carolina and be appropriately licensed as a Contractor as provided in General Statutes Chapter 87. Each bidder shall make positive efforts to use small and minority owned business enterprises on this project through the Owner's Minority Business Plan. **Any bid submitted without the completed proper forms will be rejected.**

David Francis,
Haywood County Program Administrator
Haywood County, North Carolina

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

MODIFIED INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACTS

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the Modified General Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. *Issuing Office* – The office from which the Contract Documents are to be issued and where the bidding procedures are to be administered.

B. *Disadvantaged Business Enterprise (DBE)* – A business meeting one of the following criteria:

1. Minority Business Enterprise (MBE) – A qualified socially and economically disadvantaged minority-owned business certified by any state and/or Federal agency.

2. Women's Business Enterprise (WBE) – A qualified independent business at least 51% owned by a woman or women and certified by any state and/or Federal agency.

C. *Unbalanced Bid* - An unbalanced bid is one that meets the following criteria:

1. A mathematically unbalanced Bid is one that contains lump sum or unit bid items that do not appear to reflect reasonable actual costs. Those reasonable actual costs would include a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs that the Bidder anticipates for the performance of the items in question.

2. A materially unbalanced Bid is one that produces a reasonable doubt that Award to the low Bidder, who submitted the mathematically unbalanced Bid, would result in the lowest ultimate cost to the Owner.

D. *Responsible Bidder* - A bidder who has demonstrated the attribute of trustworthiness, as well as quality, fitness, capacity, and experience to satisfactorily perform the work described in the Contract Documents.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office upon payment of the fee stated in the advertisement or invitation to bid. The fee is non-refundable.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids. Neither the Owner nor the Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 The Owner may make such investigations as he deems necessary to determine the qualifications of the Bidder to perform the work and the Bidder shall furnish to the Owner all such information

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and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the contract, and to complete the work contemplated therein. Conditional bids will not be accepted.

3.02 Bidders shall comply with all applicable laws regulating the practice of General Contracting as provided in Chapter 87 of the General Statutes of the State of North Carolina and be properly licensed as a contractor.

3.03 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

3.04 Bidder must hold a current contractor's license appropriate for the type and magnitude of the work.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE CONDITIONS

4.01 *Site and Other Areas*

A. The Site is identified in the Bidding Documents. By definition, the Site may include rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Bidding Documents identify:

   a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

   b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

   c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

   d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are <u>not</u> part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the Modified General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion

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Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the Modified General Conditions will apply.

4. Geotechnical Report: The Bidding Documents may contain a Geotechnical Report. If included, the Geotechnical Report describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations. The Geotechnical Report is a Contract Document.

   a. The conditions described in the Geotechnical Report are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on the conditions described. Bids should be based on a comprehensive approach that includes an independent review and analysis of the Geotechnical Report, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are described in the Geotechnical Report.

   b. Nothing in the Geotechnical Report is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.

B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the Modified General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.03 of the Modified General Conditions.

4.03 *Site Visit and Testing by Bidders*

A. Bidder shall conduct Site visits during normal working hours, and shall not disturb any ongoing operations at the Site. The Owner may require site visits by the Bidder to be scheduled with the Owner in advance.

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B. The Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions. However, on request, and to the extent the Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

C. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

D. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 *Owner's Safety Program*

A. Site visits and work at the Site may be governed by an Owner's Safety Program. As the General Conditions indicate, Bidders are responsible for complying with Owner's Safety Program, if any.

4.05 *Other Work at the Site*

A. Reference is made to the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;

B. visit the Site and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site including Underground Facilities that may be made available by the Owner and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Contract Documents.

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E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;

F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of any work that may be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

5.02 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

5.03 No verbal agreement or conversation with any officer, agent or employee of the Owner, either before or after the execution of the Contract, shall affect or modify any of the terms or obligations therein.

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ARTICLE 6 – PRE-BID CONFERENCE

6.01 A mandatory pre-Bid conference will be held at 10:00 a.m., local time on January 14, 2020 at the Haywood County Administration, Maintenance, and Bus Garage Facility at 176 Farmview Road, Waynesville, North Carolina, 28786. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are required to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – SITE AND OTHER AREAS

7.01 The Site is identified in the Contract Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 8 – INTERPRETATIONS AND ADDENDA

8.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to the Engineer in writing. Interpretations or clarifications considered necessary by the Engineer in response to such questions will be issued by Addenda delivered by either mail or approved electronic means to all parties recorded by the Engineer as having received the Bidding Documents. Questions received less than five (5) days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Contractor waives the right to rely on information provided by the Engineer which is not provided in writing and in the form of a formal Addendum.

8.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

8.03 Failure of any Bidder to receive any such Addenda shall not relieve said Bidder from any obligation under his Bid as submitted.

8.04 All Addenda so issued shall become a part of the Contract Documents.

8.05 Prospective Bidders are cautioned concerning the use of a Post Office Box address as Addenda cannot be sent via overnight carrier to Post Office Boxes.

ARTICLE 9 – BID SECURITY

9.01 A Bid must be accompanied by Bid security made payable to the Owner in an amount of **five percent (5%)** of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid bond (on the form included or the standard form of the surety company) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the Modified General Conditions.

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9.02 The Bid security of the apparent Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned as necessary. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within ten (10) days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults. The Bid security of all other Bidders may be retained by Owner until the earlier of ten (10) days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned as necessary.

ARTICLE 10 – CONTRACT TIMES

10.01 The number of calendar days within which, Milestones are to be achieved and the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 11 – LIQUIDATED DAMAGES

11.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 12 – SUBSTITUTE AND "OR-EQUAL" ITEMS

12.01 The Contract for the Work, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents 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.

12.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 13 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

13.01 The Contract Documents may require the identification of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five (5) days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent

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Successful Bidder to submit a substitute. In which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

13.02 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, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in the Modified General Conditions.

13.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 14 – PREPARATION OF BID

14.01 The Bid Form included with the Bidding Documents shall be used and shall not be altered, contain any unauthorized additions, deletions, or conditional bids.

14.02 The Bidder shall not add any provision reserving the right to accept or reject an award, or to enter into a Contract pursuant to an award.

14.03 The Bid shall not contain irregularities of any kind which make the Bid incomplete, indefinite, or ambiguous as to its meaning.

14.04 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, and unit price item listed therein. Alternative Bids will not be considered unless specifically shown on the Bid Form. In the case of optional alternatives the words "No Bid," "No Change," or "Not Applicable" may be entered.

14.05 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.

14.06 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

14.07 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

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14.08 A Bid by an individual shall show the Bidder's name and official address and shall be signed by the individual.

14.09 A Bid by a joint venture shall be executed by each of the joint venturers in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

14.10 All names shall be printed in ink below the signatures.

14.11 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

14.12 Street, postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

14.13 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid.

14.14 Bidder's state contractor license number shall be shown on the Bid Form.

14.15 All attachments, certifications or acknowledgements attached to the Bid shall be executed in the same manner as the Bid.

ARTICLE 15 – BASIS OF BID; COMPARISON OF BIDS

15.01 *Lump Sum*

A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

15.02 *Base Bid with Alternates*

A. Bidders shall submit a Bid for the base Bid as shown on the Bid Form and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Schedule. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.

15.03 *Unit Price*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid Schedule.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with the Modified General Conditions.

C. Discrepancies between 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.

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15.04 *Allowances*

A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with the Modified General Conditions.

15.05 Bids will be compared on the basis of the totals of the lump sum and/or unit prices bid. The resulting Total Contract Bid Price will be compared which will include and cover the furnishing of all materials, and the performance of all labor requisite for proper completion of all the work called for under the accompanying Contract, and in the manner set forth and described in the Contract Documents.

15.06 The lowest Bidder will be that Bidder whose Bid totals the lowest number of dollars as determined above.

ARTICLE 16 – SUBMITTAL OF BID

16.01 The Bid Form in the Bidding Documents is to be completed and submitted with the Bid security.

16.02 A sealed Bid shall be received no later than the time and date prescribed and at the place indicated in the advertisement or invitation for bids. The bid shall be submitted in a single (one (1)) envelope system. The envelope shall be plainly marked with the Project title, Owners name and address in the middle of the envelope and the name, address, license number, limitation and classification of Bidder in the upper left hand corner of the envelope. The envelope shall contain the Bid security, the Bid and any other required information as defined in the advertisement or invitation for bid or bid documents.

16.03 If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED for Francis Farm Landfill, Restrictive Cover Implementation Plan." A mailed Bid shall be addressed to:

David Francis, County Program Administrator
Haywood County
215 North Main Street
Waynesville, North Carolina 28786

16.04 If received prior to the designated time of opening, bids will be securely kept, sealed. Mailed bids will be treated in every respect as though filed in person and will be subject to the same requirements. Bids received subsequent to the designated time of opening will be returned to the Bidder unopened.

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ARTICLE 17 – MODIFICATION AND WITHDRAWAL OF BID

17.01 A Bid may be withdrawn prior to the Bid opening by the Bidder by providing an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

17.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 17.01 and submit a new Bid prior to the date and time for the opening of Bids.

17.03 No Bid may be withdrawn for a period of 90 days after Bids have been opened pending the execution of a Contract with the successful bidder except as provided for in Section 143-129.1 of the North Carolina General Statutes. A Bidder must file a duly signed written notice within the time frame allowed under applicable General Statutes with the Owner and Engineer promptly after the time set for the opening of bids that demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, and that the Bidder desires to withdraw its Bid. The Owner and Engineer will review the request and if approved the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 18 – OPENING OF BIDS

18.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 19 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

19.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 20 – EVALUATION OF BIDS AND AWARD OF CONTRACT

20.01 Owner reserves the right to select any or none of the Add Alternates included in the Bid Schedule.

20.02 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids if there is a reasonable doubt that the bid will result in the lowest overall cost to the Owner even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advanced payment.

20.03 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as

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nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

20.04 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

20.05 In evaluating Bids, Owner will consider 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.

20.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

20.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.

20.08 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid including the selected Add Alernatives.

ARTICLE 21 – CONTRACT SECURITY AND INSURANCE

21.01 The Modified General Conditions, and as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds and insurance documentation.

ARTICLE 22 – SIGNING OF AGREEMENT

22.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents which are identified in the Agreement as attached thereto. Within 10 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. The Owner shall thereafter set a time and place for a Preconstruction conference. One fully signed counterpart of the Contract Documents shall be provided to the Contractor following review from the Owner's legal counsel.

ARTICLE 23 – RETAINAGE

23.01 Provisions concerning Contractor's rights to deposit securities in-lieu of retainage are set forth in the Agreement.

ARTICLE 24 – COMMENCEMENT OF WORK

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24.01 Upon execution and delivery of the Contract and the delivery of the required Performance and Payment Bonds and insurance certificates and policies by the Contractor to the Owner, the Contractor will be notified to proceed with the work of the Contract. The work of the Contract shall be commenced within ten (10) days following such notification or as otherwise specified in the Notice to Proceed.

24.02 The Contractor shall notify the Engineer, in writing, of his intention to enter upon the site of the work at least three (3) days in advance of such entrance.

ARTICLE 25 – PREQUALIFICATION OF EQUIPMENT SUPPLIERS

25.01 Certain equipment on this project may require the prequalification of manufacturers prior to the receipt of bids. When required by the Contract Documents, manufacturers wishing to supply equipment for this project must submit a prequalification submittal to the Engineer for approval. The prequalification submittal must be submitted by the equipment manufacturer and received by the Engineer by the specified time listed in the Contract Documents to receive consideration. The submittal shall demonstrate that the proposed equipment meets the requirements of the Contract Specifications and Drawings. The Engineer will issue an addendum prior to the bid date listing the approved manufacturers.

25.02 The submittal of prequalification information does not omit the requirement for the Contractor and manufacturers to submit complete shop drawing submittals to the Engineer in accordance with the Contract Documents.

25.03 The prequalification submittal shall be made in accordance with paragraph 2.1 of Specification Section 013300 "Submittal Procedures" a minimum of 14 days prior to the bid date.

25.04 The naming of manufacturers in the technical specifications is given as a basis for comparison and does not omit the requirement for the Contractor and manufacturers so named to provide a prequalification submittal.

25.05 The manufacturer is responsible for visiting the site prior to the bid. Failure to visit the site to understand all existing facility, operation, and site conditions does not relieve the manufacturer from complying with all of the requirements of the Contract Documents and specifications.

25.06 Refer to the individual equipment specifications for prequalification requirements.

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BID FORM

Francis Farm Landfill
Restrictive Cover Implementation Plan
Haywood County, North Carolina

14.00708

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ARTICLE 1 – BID RECIPIENT

This Bid is submitted to:

David Francis, County Program Administrator
Haywood County
215 North Main Street
Waynesville, North Carolina 28786

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to

acceptance for **90** days after the date of the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Project Site and has become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures, including Underground Facilities, at or contiguous to the Site which have been included as a part of the Contract Documents.

E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents,

and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder or, if no written response was made by Engineer, that Bidder has resolved the issue to its satisfaction prior to the submittal of its Bid.

J. The Bidding Documents are sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

K. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

L. Bidder has not relied upon any information provided by the Engineer except information which is part of the Bidding Documents and is in writing and in the form of a formal addendum.

M. The submission of a Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Bid Documents and the Instructions to Bidders, and that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents.

ARTICLE 4 – FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 – BASIS OF BID

Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

UNIT PRICE BID

See attached Bid Schedule

SECTION A - BASE BID					
ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	Mobilization/General Requirements (3% Maximum)	1	LS		
2	Demolition	1	LS		
3	Clearing and Grubbing	1	LS		
4	Seeding, Fertilizing, and Mulching	1	LS		
5	Silt Fence	6,000	LF		
6	Super Silt Fence	400	LF		
7	Construction Entrance	2	EA		
8	Erosion Control Matting	30	AC		
9	Riprap Check Dams	30	EA		
10	Wattles	40	EA		
11	Pipe Inlet Protection	5	EA		
12	Structure Inlet Protection	7	EA		
13	Temporary Skimmer Basins	2	EA		
14	Permanent Stormwater/Sediment Control Pond	2	EA		
15	Riprap (All Types) w/ Filter Fabric Underlayment	2,500	Ton		
16	6' Inner Fence	5,450	LF		
16A	4'X6' Single Swing Chain Link Gate	3	EA		
16B	12'X6' Double Swing Chain Link Gate	4	EA		
16C	20'X6' Double Swing Chain Link Gate	1	EA		
16D	24'X6 Double Swing Chain Link Gate	1	EA		
17	Outer Fence	3,200	LF		
17A	4'X4' Single Swing Chain Link Gate	2	EA		
17B	12'X4' Double Swing Chain Link Gate	2	EA		
18	CABC Stone	3,450	Ton		
19	I19.0B Intermediate Course	950	Ton		
20	S9.5B Superpave Surface Course	850	Ton		
21	Retaining Wall	1	LS		
22	Guardrail	660	LF		
23	Terrace/Ditch Toe Drain	3,500	LF		
24	Earthwork	1	LS		
25	Soil Screening	90,000	CY		
26	Rock Excavation	500	CY		
27	Remove and Replace Unsuitable Material	1,000	CY		
28	30-inch Vegetative Support Layer	836,000	SF		
29	40-mil LLDPE Textured Liner	836,000	SF		
30	8-ounce Double-Sided Geocomposite	925,000	SF		
31	Permanent Liner Edge	1	LS		
32	Liner Edge Marker	34	EA		
33	Groundwater MW15 Well Protection	1	LS		
34	Bi-Axial Geogrid	5,400	SY		
35	Raising Wellhead: LFG only	13	EA		
36	Raising Wellhead: LFG & leachate	8	EA		
37A	4" HDPE Leachate Collection/Landfill Gas Piping	2,200	LF		
37B	6" HDPE Leachate Collection/Landfill Gas Piping	4,000	LF		
37C	8" HDPE Leachate Collection/Landfill Gas Piping	1,950	LF		
38	6" Butterfly Valve	4	EA		

39	Cleanouts - HDPE Leachate Collection Piping	7	EA		
40	LFG Flare Station Restart	1	LS		
41	1,000 Gallon Septic Tank W/ Effluet Filter	1	LS		
42	Duplex Package Pump Station	1	LS		
43	Septic Tank Abandonment	1	LS		
44	2" HDPE Force Main	100	LF		
45	3" HDPE Force Main	1,100	LF		
46	Air Release Valve	1	EA		
47A	15-inch HDPE Pipe	140	LF		
47B	18-inch HDPE Pipe	120	LF		
47C	30-inch HDPE Pipe	55	LF		
47D	36-inch HDPE Pipe	270	LF		
48	Stormwater Concrete Headwall	8	EA		
49	Flared End Section	1	EA		
50	Stormwater Junction Box	2	EA		
51	Stormwater Catch Basin	4	EA		
52	Stormwater Open Throat Inlet	1	EA		
53	Connection to Existing Catch Basin	1	EA		
54	Asphalt Curb	240	LF		
55	2" PVC Conduit Duct Bank	1,300	LF		

56	Erosion Control Cash Allowance	1	LS	$50,000.00	$50,000.00
					$50,000.00

57	Stream Crossing	1	LS		

Bidder acknowledges that estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within 330 calendar days after the date when the Contract Times commence to run as provided in the Modified General Conditions, and will be completed and ready for final payment in accordance with the Modified General Conditions within 365 calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid security in the form of a certified check, money order, or Bid Bond.

B. List of Proposed Subcontractors

C. Completed Bid Schedule

D. Affidavit of Compliance – North Carolina – E-Verify Statutes

E. (List other documents as pertinent)

ARTICLE 8 – BID SUBMITTAL

This Bid Submitted By:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____ (CORPORATE SEAL)

Attest _____

Date of Authorization to do business in *[State Where Project is Located]* is _____

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer 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.)

Bidder's Business Address _____

_____

Phone No. _____ Fax No. _____

SUBMITTED on _____, 20____.

State Contractor License No. _____.

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name, and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:

BID

Bid Due Date:

Description *(Project Name— Include Location)*:

BOND

Bond Number:

Date:

Penal sum _____ $ _____

(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
Title	Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

AFFIDAVIT of COMPLIANCE

With N.C. E-Verify Statutes

STATE OF NORTH CAROLINA

I, _____ (hereinafter the "Affiant"), duly authorized by and on behalf of _____ (hereinafter the "Employer") after being first duly sworn deposes and says as follows:

1. I am the _____ (President, Manager, CEO, etc.) of the Employer and possess the full authority to speak for and on behalf of the Employer identified above.

2. Employer understands that "E-Verify" means the federal E-Verify program operated by the United States Dept. of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law.

3. _____ Employer employs 25 or more employees in the State of North Carolina, and is in compliance with the provisions of N.C. Gen. Stat. §64-26. Employer has verified the work authorization of its employees through E-Verify and shall retain the records of verification for a period of at least one year.

_____Employer employs fewer than 25 Employees and is therefore not subject to the provisions of N.C. Gen. Stat. §64-26.

4. All subcontractors engaged by or to be engaged by Employer have or will have likewise complied with the provisions of N.C. Gen. Stat. §64-26.

5. Employer shall keep the Town informed of any change in its status pursuant to Article 2 of Chapter 64 of the North Carolina General Statutes.

Further this affiant sayeth not.

This the ___day of _____, 20____.

Affiant _____

STATE OF NORTH CAROLINA COUNTY OF _____

Sworn to and subscribed before me, this the _____day of _____, 20_____ .

_____ [SEAL]

Notary Public

My commission expires: _____

NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

CORPORATION

The prequalified bidder being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, and that the prequalified bidder intends to do the work with his own bonafide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion affidavit, the Contractor is certifying his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF PREQUALIFIED BIDDER

_____
Full name of Corporation

_____
Address as Prequalified

Attest _____ By _____
Secretary/Assistant Secretary — President/Vice President/Assistant Vice President
Select appropriate title — *Select appropriate title*

_____ _____
Print or type Signer's name — Print or type Signer's name

CORPORATE SEAL

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the
_____ day of _____ 20__.

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

NOTARY SEAL

DEBARMENT CERTIFICATION OF PREQUALIFIED BIDDER

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation that is file with the Department, or has become erroneous because of changed circumstances.

2. The terms *covered transaction*, *debarred*, *suspended*, *ineligible*, *lower tier covered transaction*, *participant*, *person*, *primary covered transaction*, *principal*, *proposal*, and *voluntarily excluded*, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273)* provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion affidavit and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐ Check here if an explanation is attached to this certification.

NOTICE OF AWARD

Date: _____

Project:	
Owner:	Owner's Contract No.:
Contract:	Engineer's Project No.:
Bidder:	
Bidder's Address:	

You are notified that your Bid dated _____for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for _____.

The Contract Price of your Contract is _____Dollars ($_____).

_____ copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

You must comply with the following conditions precedent within ten (10) days of the date you receive this Notice of Award.

1. Deliver to the Owner [_____(____)] fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] and other documents as specified.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

_____
Owner
By:_____
Authorized Signature
_____
Title

ACCEPTED

_____
Contractor
By: _____
Authorized Signature
_____
Title

<u>MODIFIED</u> AGREEMENT BETWEEN OWNER AND CONTRACTOR

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
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MODIFIED AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between _____ ("Owner") and

_____ ("Contractor").

Effective Date of Agreement: _____

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The construction of a 20-acre LLDPE landfill cap, including approximately 200,000 cubic yards of earthwork, paved access road construction, installation of an arched culvert over a stream, installation of landfill gas (LFG) and leachate collection piping, raising existing LFG extraction wellheads, installation of a sewerage pump station and force main, stormwater piping, and erosion control measures.

ARTICLE 2 – ENGINEER

2.01 The Project has been designed by McGill Associates, P.A. (Engineer), which is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 3 – CONTRACT TIMES

3.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

3.02 *Dates for Substantial Completion and Final Payment*

A. The Work will be substantially completed within 330 calendar days, and completed and ready for final payment in accordance with the Modified General Conditions within 365 calendar days.

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3.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 3.02 above, plus any extensions thereof allowed in accordance with Article 12 of the Modified General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration 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 **$ 500.00** for each calendar day that expires after the time specified in Paragraph 3.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner **$** for each calendar day that expires after the time specified in Paragraph 3.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 4 – CONTRACT PRICE

4.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount equal to the sum of the amounts determined pursuant to Paragraphs 4.01.A, and 4.01.B below:

A. For lump sum work an amount equal to the percentage completed of specific items of work provided by the Contractor as a schedule of values for the Lump Sum work.

B. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the actual quantity of that item. The unit price for each item is as supplied in the Bid for the project.

ARTICLE 5 – PAYMENT PROCEDURES

5.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the Modified General Conditions. Applications for Payment will be processed by Engineer as provided in the Modified General Conditions.

5.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraph 5.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the Modified General Conditions (and in the case of Unit Price Work based on the number of units completed).

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1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the Modified General Conditions.

    a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 97.5 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the Modified General Conditions and less 250 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

5.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the Modified General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 6 – CONTRACTOR'S REPRESENTATIONS

6.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has reviewed all General and Supplementary Conditions applicable to the Work.

E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and

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procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 6.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 7 – MISCELLANEOUS

7.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the Modified General Conditions and the Supplementary Conditions.

7.02 *Assignment of Contract*

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are 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 Documents.

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7.03 *Successors and Assigns*

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

7.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall 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.

7.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 7.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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ARTICLE 8 – CONTRACT DOCUMENTS

8.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages _ through _, inclusive).
2. Performance bond (pages __ through __, inclusive).
3. Payment bond (pages ___ through __, inclusive).
4. Other bonds (pages __ through __, inclusive).
5. Notice of Award (pages ___ through ___, inclusive).
6. Modified General Conditions (pages 1 through 82, inclusive).
7. Supplementary Conditions (pages __ through __, inclusive).
8. Specifications as identified in the table of contents of the bound Project Manual.
9. Site Specific Construction Quality Assurance Plan
10. Drawings consisting of ___ sheets with each sheet bearing the following general title: _____
11. Addenda (numbers __ through __, inclusive).
12. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid (pages __ through __, inclusive).
13. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
    a. Notice to Proceed (pages _ through __, inclusive).
    b. Work Change Directives.
    c. Change Orders.

B. The documents listed in Paragraph 8.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 8.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the Modified General Conditions.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

OWNER:

_____

By: _____

Title: _____

Attest: _____

Title: _____

Address for giving notices:

_____

_____

_____

Pre-Audit Statement: This instrument has been preaudited in the manner required by the Local Budget and Fiscal Control Act as amended.

_____

By: _____

Title: _____

Date: _____

Approved as to Form:

_____

By: _____

Title: _____

Date: _____

CONTRACTOR

_____

By: _____

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Title: _____

Address for giving notices:

_____

_____

_____

License No.: _____

Agent for service of process:

_____

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PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest:_____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By:_____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest:_____
Signature

_____
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND

Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

   5.1 Claimants who do not have a direct contract with the Contractor,

      5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2 Pay or arrange for payment of any undisputed amounts.

   7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in

the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default**: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

ATTACH INSURANCE CERTIFICATES HERE

NOTICE TO PROCEED

Date: _____

Project:	
Owner:	Owner's Contract No.:
Contract:	Engineer's Project No.:
Contractor:	
Contractor's Address:	

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before the 10th day following this date, you are to commence work and start performing your obligations under the Contract Documents. In accordance with the Agreement, the date of Substantial Completion is _____, and the date of Final Completion is _____.

Contractor	Owner
	Given by:
Authorized Signature	Authorized Signature
Title	Title
Date	Date

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

MODIFIED STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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Endorsed by

CONSTRUCTION SPECIFICATIONS INSTITUTE

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These Modified General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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MODIFIED STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. 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 which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form provided in the Contract Documents is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

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

5. *Bid*—the offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—the individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer 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, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Construction Field Representative (CFR)*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

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12. *Contract*—the entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

13. *Contract Documents*—those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

14. *Contract Price*—the Monies payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

15. *Contract Times*—The number of calendar days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

16. *Contractor*—the individual or entity with whom Owner has entered into the Agreement.

17. *Cost of the Work*—See Paragraph 11.01 for definition.

18. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

19. *Effective Date of the Agreement*—the date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

20. *Engineer*—the individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*—Sections of Division 1 of the Specifications.

23. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

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

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

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26. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

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

28. *Notice of Award*—the written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement. The Notice of Award shall not be construed as an agreement or contract. Contractor has no rights or remedies against Owner until the Notice to Proceed has been issued.

29. *Notice to Proceed*—a written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

30. *Owner*—the individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

31. *PCBs*—Polychlorinated biphenyls.

32. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

33. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

34. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

35. *Project Manual*—the bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents. The Project Manual contains any and all addenda issued, documents executed by the Owner and Contractor or Engineer after bidding, and all attachments and exhibits thereto, up to and including the executed copy of the Notice to Proceed.

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

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

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38. *Schedule of Submittals*—a schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *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.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *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 at the Site.

44. *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 fully utilized for the purposes for which it is intended. As a precedent condition to Substantial Completion the Owner shall have received all certificates of occupancy and any other necessary permits for beneficial occupancy. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—the Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—that part of the Contract Documents which amends or supplements these Modified General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, material man, 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 Subcontractor.

48. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water

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levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

49. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. *Unit Price Work*—Work to be paid for on the basis of unit prices.

51. *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, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. 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

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authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents or general standards of workmanlike construction or published authorities which govern the proper use and application of a particular material or component, including but not limited to literature published by manufacturers and trade organizations; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean 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, shall mean 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, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. 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.

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ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish. The Owner shall have authority to review and reject any bonds as nonconforming.

B. Within fifteen (15) calendar days after the Effective Date of the Agreement, but before any Work at the Site is started, Contractor shall deliver to Owner, with a copy to Engineer, certificates and other evidence of insurance requested by Owner which Contractor is required to purchase and maintain in accordance with paragraphs Article 5 of these Modified General Conditions. The Owner shall have the authority to review and reject any insurance as nonconforming.

2.02 *Copies of Document*

A. Engineer shall furnish to the successful Contractor up to three (3) sets of the Project Manual. Additional sets will be made available by the Engineer to the Contractor at the cost set forth in the Advertisement for Bids for this project or the actual cost for reproduction whichever is greater.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contractor shall complete all of the work contracted herein, in an acceptable manner and within the established Contract Time. The Contract Time shall commence on the start date given in the Notice to Proceed, and shall run continuously each and every calendar day following, except as herein provided, and in accordance with paragraph 17.02. Times shall be of the essence of this Agreement.

2.04 *Starting the Work*

A. The Contractor shall commence work on or before the tenth (10th) calendar day after the date of the Notice to Proceed or as may be differently stated in the Notice to Proceed. Contractor shall not start work prior to the date set in the Notice to Proceed.

2.05 (Intentionally Deleted)

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a Preconstruction 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 Contractor's schedule for completion of the work, policies and procedures for submittal of Shop Drawings and other submittals, presentation and processing of Applications for Payment, and maintaining records required by the Contract Documents. If agreed between Owner and Contractor, the Preconstruction Conference may be held prior to the commencement of the Contract Times.

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

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Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of, and legally bind each respective party.

2.07 *Submission and Acceptance of Schedules*

A. Prior to presentation of the first Application for Payment, the Contractor shall submit the following schedules. No progress payment shall be made to Contractor until acceptable Schedules are submitted to Engineer. All schedules shall be coordinated and shall be logically related in time and value for the various stages of work.

1. The Progress Schedule. The Progress Schedule shall be computer generated, utilizing the critical path method (CPM), indicating the dates and duration for completing the various stages of the Work, including any milestones. The level of detail a number of tasks shown in the Progress Schedule shall be commensurate with the complexity of the work. The Progress Schedule shall be acceptable to Engineer if at a minimum it clearly and accurately demonstrates an orderly progression and completion of the work within the contract times. Contractor shall be solely responsible for scheduling and completing the work within the contract time. Any approval or acceptance of the schedule shall 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 for completion within the contract time.

2. The Schedule of Submittals. The Schedule of Submittals shall provide a workable arrangement for the, engineer to timely review and process the required submittals. The Schedule of Submittals shall also include a list of manufacturers and suppliers. Approval of any schedule by Engineer shall not receive the Contractor from its obligations under the Contract.

3. The Schedule of Values. The Contractors Schedule of Values shall provide a reasonable allocation of the Contract Price to component parts of the Work. Contractor's Schedule of Values for all of the Work shall include quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail, commensurate with the complexity of the Work, to serve as the basis for progress payments during performance of the Work. The Schedule of Values shall have line items for project closeout including, demobilization, record drawings, completion of the punch list and project restoration and final cleanup. Approval of any Schedule by Engineer shall not relieve the Contractor from its obligations under the Contract.

4. Cash Flow Schedule. Contractor's Cash Flow Schedule shall be a scheduled and forecasted value of the anticipated payment requests for the Work. The amounts shown shall be considered an estimate which may differ from the actual amounts requested.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

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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. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect as of the date Engineer sealed, signed, and dated the Contract Documents, except as may be otherwise specifically stated in the Contract Documents.

2. The Contract Documents shall be deemed to include applicable building codes, laws and regulations, relevant published industry and trade organization standards, as well is the published requirements of any product manufacturer. However, no such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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 Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby. Contractor's failure to notify Engineer of any such discrepancy prior to commencement of Work shall constitute a waiver of Contractor's right to seek additional compensation or damages for any alleged discrepancy later discovered by Contractor.

a. Contractor (and any Subcontractor responsible for the performance of all or any part of such Work) shall field verify the accuracy of all grades, elevations, dimensions, locations, orientation and measurements. This shall include locations of any underground utilities or other features which may be shown generally on the drawings for informational purposes only. The Engineer shall be promptly notified in writing of any discrepancies. Contractor's failure to notify Engineer of any such discrepancy prior to

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commencement of Work shall constitute a waiver of Contractor's right to seek additional compensation or damages for any alleged discrepancy later discovered by Contractor.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, 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) any standard, specification, manual, or code, or (c) 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 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04. Contractor's failure to notify Engineer of any such discrepancy prior to commencement of Work shall constitute a waiver of Contractor's right to seek additional compensation or damages for any alleged discrepancy later discovered by Contractor.

a. In the event Contractor determines that some aspect of the Contract Documents require clarification or interpretation by Engineer, Contractor shall submit a Request for Information (RFI) in writing to Engineer in a format provided by Engineer. RFIs may only be submitted by the Contractor and shall be in the form required by Engineer. Verbal RFI or a RFI presented on an unapproved form shall be rejected. Any delay caused by Engineer's refusal to accept a verbal RFI or a RFI presented on an unapproved form will be attributed solely to Contractor. Each RFI shall be limited to a single issue. Information that is discernible from the Contract Documents as well as issues concerning construction means, methods, techniques, sequences or safety will not be addressed by Engineer.

b. Contractor shall clearly and concisely state the issue for which clarification or interpretation is sought and why a clarification or interpretation is needed. The RFI process shall not be used by Contractor to seek approval for proposed "or-equal" or substitute materials or equipment.

c. Engineer's review of or responses to RFIs shall not constitute an approval, direction, or procedure related to the construction means, methods, techniques, sequences, or safety.

d. Responses to Contractor RFIs will not change any requirement of the Contract Documents. In the event Contractor believes that a response to an RFI will cause a change in the Contract Price or Contract Time, Contractor shall give written notice of the Claim to Engineer.

e. If Contractor wishes to make Claim for an adjustment of the Contract Price or an extension of the Contract Times, or both, written notice as provided in Paragraph 10.05 shall be given before proceeding to execute the Work. Failure to give such written notice shall waive Contractor's right to seek an adjustment of the Contract Price or an extension of the Contract Times.

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B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); 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 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier 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 editions; or

2. 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 of such documents by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for ordinary record keeping purposes.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify, defend, and hold harmless Engineer, and the Owner and their employees, principals, agents, successors, insurers, sureties and assigns, from and against any and all liabilities, claims, causes of actions, suits of any nature, fines, penalties, expenses, costs, losses, and damages (including but not

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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, resulting from, or relating to the unauthorized use, reuse, or modification of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions, by Contractor, its employees, agents, or any other person or entity for whom Contractor is legally liable.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, surveys, graphics, or other types are furnished, if at all, only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. To the extent that any discrepancy exists between the electronic files and the hard copies, the hard copies shall govern.

   1. The Engineer may, but shall not be obligated to, make copies of requested Drawings in electronic format for the Contractor's convenience and to facilitate the Contractor's administration of the Project. Because information presented on electronic files can be modified, unintentionally or otherwise, the Engineer reserves the right to remove all indications of ownership from each electronic display. Notwithstanding the removal of indicia of ownership, the Engineer's copyright interest in such files and the information contained therein shall not be abridged or abated by such action. The use of electronic files prepared by the Engineer shall not in any way relieve the contractor of its duty to fully comply with the Contract Documents nor negate the Contractor's responsibility for coordination of other trades, and taking field measurements.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. To the extent that any errors are detected, the receiving party shall provide written notice to the transferring party, which party shall correct such errors identified within the 60 day acceptance period.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor 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. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are

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unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefore as provided in Paragraph 10.05.

B. In the event the Project involves private land, upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's 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.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Contract Documents identify:

1. If during the preparation of these Contract Documents, subsurface or geotechnical explorations were conducted which are relevant in the discretion of the Engineer to the scope of the work, the findings of such will be included in the Appendix of the Specifications. The Contractor shall be responsible for obtaining such reports and explorations it deems necessary and advisable for the performing of the Work in accordance with the Contract Documents.

2. Information and data reflected in the Contract Documents with respect to existing structures and facilities at or contiguous to the Site are based upon information obtained from varying sources which may include reports, drawings or other data of those facilities presently on file with the Owner. The Owner and Engineer do not guarantee the accuracy of any such information. The Contractor shall be responsible for field verifying all conditions and measurements and for determining the suitability of the site for the proposed Work.

B. *Limited Reliance by Contractor on Technical Data Authorized:* any reports and drawings which have been identified in Article 4.02 A 1 are not Contract Documents. However, in the event the Engineer specifically calls out and designates certain information in such reports and drawings as "Technical Data" than Contractor shall have a limited right to rely upon the accuracy of the designated Technical Data. Other than the designated Technical Data, any information provided and depicted on the Drawings is merely intended to be a general representation of the physical conditions likely be encountered during the Work and shall not constitute a guarantee or warranty by the Engineer or Owner that actual conditions will not vary from that which is depicted. Except for the Contractor's right to rely on the designated technical data, which is limited as more specifically shown below, 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; or

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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.

4. The information provided herein and depicted on the project drawings are not guaranteed by the Owner or Engineer to be more than a general representation of the physical conditions likely to be encountered during the Work.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor discovers or should reasonably have discovered, or otherwise reasonably believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "Technical Data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

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; and is not in the area of the project bid as Unclassified Excavation;

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 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition 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 circumstance must meet the conditions of Paragraph 4.03. A; and

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 Paragraphs 9.07 and 11.03.

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2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final 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

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any consequential damages, including but not limited to claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project, and Contractor expressly and specifically releases any and all damages related thereto. Any damages for suspension or idle time shall be limited to the Contractor's actual cost of labor or equipment costs, including a reasonable markup for overhead but shall not include a markup for profit.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Contract Documents:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data;

b. locating all Underground Facilities shown or indicated in the Contract Documents;

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

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d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefore as provided in Paragraph 10.05.

3. Generally, service connections are not indicated on the project drawings. Contractor shall be responsible for locating all existing underground utility installations in advance of excavation.

C. *Underground Utility Damage Prevention Act:*

1. Contractor shall be required and agrees to comply with all the provisions of any applicable underground utility damage prevention act (however titled) and hereby agrees, to the fullest extent permitted by Laws and Regulations, to indemnify, defend, and hold harmless Owner, Engineer, and their employees, principals, agents, successors, sureties, insurers and assigns, including any of their Related Entities, if any, 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 Contractor's failure, or the failure of anyone for whom Contractor is responsible, to so comply with the requirements of said act, except the Contractor shall not be required to indemnify any person or entity for acts attributable to the sole negligence of such person or entity.

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4.05 *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.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Contract Documents for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on designated Technical Data Authorized:* Contractor may rely upon the accuracy of any designated "Technical Data" contained in such reports and drawings, but such reports and drawings are not Contract Documents, and Contractor's reliance on the designated Technical Data is limited to the extent specifically described in set forth in Article 4.02 B. Except for such reliance on such "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; or

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 any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for

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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 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefore as provided in Paragraph 10.05.

F. 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. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefore as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. 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 or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. 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 a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

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ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents. The Owner shall be solely responsible for determining the adequacy and sufficiency of the bonds for the Project.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds 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 shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions. The Owner shall be responsible for determining the sufficiency and adequacy of such bonds and insurance.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Contract Documents, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain. The Owner shall be solely responsible for determining the adequacy and sufficiency of the insurance requested under the Contract Documents and any certificates of insurance which are furnished hereunder.

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B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Contract Documents, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. Neither Owner nor Engineer represents that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the cap contract documents, including under the indemnities granted in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, 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:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting there from; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle; and

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7. claims for damages arising out of Contractor's performance or providing of professional architectural or engineering services in accordance with Paragraph 6.21.B.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insured's (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Contract Documents, all of whom shall be listed as additional insured's, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insured's, and the insurance afforded to these additional insured's shall provide primary coverage for all claims covered thereby;

2. include the specific coverages herein required or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 60 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Contract Documents to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

a. Such insurance shall remain in effect for two years after final payment.

b. Contractor shall furnish Owner and each other additional insured identified in the Contract Documents to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

C. Satisfactory certificates of insurance shall be submitted and attached to the executed Agreement for Construction between the Owner and Contractor. In connection with the provisions set forth in the Modified General Conditions, the Notice to Proceed will not be issued until satisfactory certificates of insurance are filed.

D. <u>Specified Limits of Insurance Required to be Carried by Contractor</u>

1. Worker's Compensation and Employer's Liability

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This insurance shall protect the Contractor and Owner and the Engineer against all claims under applicable state workmen's compensation laws. The Contractor and Owner shall also be protected against claims for injury, disease, or death of employees that, for any reason, may not fall within the provisions of a workmen's compensation law. This policy shall include an "all states" endorsement.

The liability limits shall be not less than:
Worker's Compensation ..... Statutory
Employer's Liability ..... $500,000 each occurrence

2. Comprehensive Automobile Liability

This insurance shall be written in comprehensive form and shall protect the Contractor and Owner and engineer against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired.

The liability limits shall be not less than:

Bodily Injury	$1,000,000 each person
	$1,000,000 each occurrence
Property Damage	$1,000,000 each occurrence
	$1,000,000 aggregate

3. Comprehensive General Liability

This insurance shall be written in comprehensive form and shall protect the Contractor and Owner against all claims arising from injuries to persons other than his employees or damage to property of the Owner or others arising out of any act or omission of Contractor or his agents, employees, or Subcontractors. The policy shall also include protection against claims insured by usual personal injury liability coverage and shall include a "protective liability" endorsement to insure the contractual liability assumed by the Contractor under the indemnification provisions in the Modified General Conditions, and "Completed Operations and Products Liability" coverage (to remain in force during the correction or warranty period required under this Agreement.

To the extent that the Contractor's work, or work under his direction, may require blasting, explosive conditions, or underground operations, the comprehensive general liability coverage shall contain no exclusion relative to blasting, explosion, collapse of building, or damage to underground property.

Bodily Injury	$1,000,000 each person
	$1,000,000 each occurrence
Property Damage	$1,000,000 each occurrence
	$2,000,000 aggregate

4. Umbrella Liability Policy

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This insurance shall protect the Contractor against all claims in excess of the limits provided under the workmen's compensation and employer's liability, comprehensive automobile liability, and general liability policies. The liability limits of the umbrella liability policy shall not be less than $5,000,000.

E. Contractor covenants and agrees that the insurance coverage and limits required by the Contract Documents shall in no way be considered or used in any manner as a limit or cap of any kind on any liability or obligation that Contractor may otherwise have, including, without limitation, liability under the indemnification provisions contained herein.

1. by requiring such insurance and insurance limits, neither Owner nor Engineer represents that such coverage and limits will necessarily be adequate to protect Contractor.

2. Contractor shall be responsible for any deductible or self-insured retention.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Contractor shall purchase and maintain Builder's Risk insurance for the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Contract Documents or required by law). Contractor shall be responsible for all associated costs for such insurance. This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Contract Documents, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Contract Documents.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials

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and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued. The Owner shall be solely responsible for determining the adequacy and sufficiency of such Builders Risk insurance.

B. Unless otherwise provided in the Contract Documents, Contractor shall purchase and maintain such boiler and machinery insurance or any other additional property insurance required by the Contract Documents or Laws and Regulations, which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Contract Documents, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest in the project and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 60 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Contract Documents. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. (Intentionally deleted)

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees there under. Owner and Contractor waive all rights against each other and their 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

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or resulting from any of the perils 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 Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (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. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued. This Waiver of Subrogation shall survive the completion or termination of this Agreement.

B. Owner, and Contractor waive all rights against each other, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner, or any other loss of profits or other consequential damages; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them. This provision shall survive the completion and/or termination of the Agreement.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the Monies so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall

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adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party fails to purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, 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. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *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. The Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. The Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

Contractor shall provide competent, qualified, on-site, supervision at all times during construction activities including supervision of the activities of the sub-contractor(s), vendors and suppliers through a Resident Superintendent. The Resident Superintendent shall be on-site at any time that work is ongoing at the project. Sub-contractors shall not work independently on the project without on-site supervision provided Resident Superintendent. A resume for the Resident Superintendent shall be submitted to the Engineer for approval prior to commencing work. Such resumes shall include projects that they were in responsible charge of, that are of similar work in scope and value with owner's references. Contractor shall not change the

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Resident Superintendent without written approval from the Engineer. However, the approval of any supervisor by the Engineer shall not relieve the Contractor of its obligation to properly supervise and perform the Work.

B. If at any point during the progress of the Work the Owner determines, in its sole discretion, that the Resident Superintendent is inadequately performing its services, the Owner may direct in writing the Contractor to replace the Resident Superintendent within thirty (30) days of such notification. The resumes of any proposed new Resident Superintendent shall be submitted to the Engineer for approval prior to their commencement of work on the project.

   1. The Resident Superintendent shall provide Owner and Engineer with a written daily field report containing, as a minimum, the following information:

      a. the number of personnel on site, identified by craft or trade, employer and work activity, and the number of hours worked during the workday;

      b. the types and numbers of equipment on site and the time each piece of equipment was used or stood idle during the workday;

      c. any materials or equipment received on site during the workday; and

      d. the identification and quantity of any unit price work, if any, installed during the day.

      Said daily field reports shall be submitted to Owner and Engineer not less than weekly.

C. For purposes of giving or receiving notices, directives, Change Orders, or any other information from Owner or Engineer to Contractor, Contractor shall designate a specific individual as Project Manager to receive such notices, directives, Change Orders, or other information. If the person so designated by Contractor is not available, Contractor shall (in writing addressed to Owner and Engineer) identify the individual who is acting as his authorized representative.

D. Contractor acknowledges that its obligation to complete the Work in accordance with the Contract Documents shall not be affected or amended as a result of any act by Engineer or any other Owner's consultant, or as a consequence of any field inspections or observations or approval of any Application for Payment, or in regard to any other duty performed by Engineer or other Owner's consultant for the benefit of Owner, unless Owner and Engineer shall expressly approve Contractor's action in advance in writing specifically identifying the action approved. Furthermore, Contractor shall not be relieved of any responsibility to complete the Work in conformity with the contract Documents as a consequence of any knowledge of non-conformity obtained by an Owner's representative, including Engineer, whether or not such representative acts or fails to act on such knowledge. Contractor acknowledges and agrees that any representative retained by Owner to act for Owner's benefit, including Engineer, shall have no duty or responsibility to Contractor, except where specifically stated herein, and no act or failure to act by such Owner's representative shall relieve Contractor of its obligations to perform all requirements under this Contract, except as specifically approved in writing otherwise.

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6.02 *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 at all times maintain good discipline and order at the Site.

B. 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 shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

C. No Work shall be done between 6 p.m. and 7 a.m. without permission of Owner. However, emergency work may be accomplished without prior permission. No Night Work may be undertaken without permission of Owner.

D. Each occasion Contractor works in excess of 45 hours per week, or outside of the hours of 7:00 am and 6:00 pm, or on weekends or holidays, the Contractor shall reimburse Owner for any and all costs and expenses (including, but not limited to, Engineer's fees and expenses associated with additional Observation and Contract Administration) incurred by Owner as a result of such schedule. Contractor covenants and agrees that Owner may retain, deduct, and/or offset monies due to Owner pursuant to this Paragraph from monies due to Contractor under the Agreement. Contractor further covenants and agrees that Owner retains the right to make such deduction or offset at any time prior to and including final payment and that the imposition and the deduction and/or offset of such monies shall not be subject to any notice or claim provisions of the Contract Documents.

6.03 *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.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

1. To the extent possible, all warranties shall run to and be enforceable by Owner. Contractor agrees to assign to Owner at the time of final completion of the Work, or as otherwise required by the Contract Documents, any and all Subcontractor and Supplier warranties relating to materials and labor used in the Work and Contractor further agrees to perform the Work in such a manner to preserve any and all Subcontractors' and Suppliers' warranties. Contractor shall provide Owner assistance, throughout the duration of such warranties, in enforcing the obligations of Subcontractors and Suppliers. If necessary as a matter of law, Contractor may retain the right to enforce directly any such Subcontractors' and Suppliers'

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warranties during the one-year period following the date of Substantial Completion established by Paragraph 14.04. Contractor includes in this warranty materials and equipment specified by Engineer by brand name. The warranty provided in this Paragraph 6.03 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law and shall be in addition to all other rights and remedies available to Owner. All warranty obligations are cumulative to and in addition to all remedies available to Owner pursuant to the Contract Documents and applicable law.

C. All materials and equipment shall 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.

D. Materials and equipment stored off site shall be stored in a bonded, secure warehouse. Any such materials and equipment stored off site shall be available for review by Engineer's representative. Material and equipment shall be stored and maintained while in storage in a manner consistent with the manufacturer's recommendations. Such maintenance during storage, or prior to startup shall be documented and presented to the Engineer. Risk of loss of stored materials and equipment shall be on Contractor, whether titled in the name of the Contractor or whether title previously passed to the Owner as a result of payment for the stored materials and equipment.

E. The Contractor shall have responsibility for the care of all equipment and materials, including those furnished by the Owner, if any, and shall bear the risk of injury, loss, or damage to any part thereof by action of the elements or from any other cause, until final completion. Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the Work or the equipment or materials occasioned by any cause before completion and acceptance of the Work and shall bear the expense therefore. Contractor shall, at no additional cost to Owner, provide temporary measures and suitable structures as they might be necessary to protect the Work or any portion thereof from damage.

F. Suspension of the Work or the granting of an extension of time for any cause whatever shall not relieve Contractor of his responsibilities for the Work as specified herein including the continuing care and maintenance of stored materials and equipment as well as work accomplished to date.

G. If the equipment furnished by the Contractor differs in dimension, orientation, horsepower requirements, pipe connection sizes, or is otherwise non-conforming to the Contract Documents, the Contractor shall be responsible for the furnishing of all properly-sized connecting piping, motor starters, motor controls, and electrical wiring and connections, and all other work required to properly install the equipment in complete operating condition. Further, such non-–conforming equipment or materials shall be submitted as a "Substitute" in accordance with Section 6.05 of the Modified General Conditions, including and subject to Paragraph 6.05. E. *Engineer's Cost Reimbursement*. No additional compensation by the Owner to the Contractor will be made with respect to such "Substitutes".

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6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 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 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

3. Contractor shall submit to the Engineer an adjusted Progress Schedule whenever the progress of the Work is behind the current, approved Progress Schedule as defined in paragraph 2.07 A.1 of the Modified General Conditions, or upon the Engineer's request and whenever the Engineer determines in its discretion that the Work cannot be substantially complete in the time remaining. The adjusted Progress Schedule must be submitted within ten (10) days of Engineer's written request and prior to the Contractor's next application for payment.

4. Owner shall have the right to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the operation of Owner's premises or any tenants or invitees thereof. Contractor shall, upon Owner's request, reschedule any portion of the Work affecting operation of the premises during hours when the premises are not in operation. Any postponement, rescheduling, or performance of the Work under this Paragraph 6.04.A.3 may be grounds for an extension of the Contract Times, if permitted under Article 12, and an equitable adjustment in the Contract Price, if permitted under Article 12 and (i) the performance of the Work was properly scheduled by the Contractor in compliance with the requirements of the Contract Documents and (ii) such rescheduling or postponement is required for the convenience of the Owner.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the Contract Documents contain a description followed by words reading "or an approved equivalent" or "or approved equal" item or "substitution is permitted," other items of material or equipment or material or equipment of other suppliers may not be submitted to Engineer for review. If the description contains or is followed by words reading "or an approved equivalent" or "or approved equal" item or "substitution is permitted," other items of material or equipment or material or equipment of other suppliers may be substituted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that

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no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics; and

2) it will reliably perform at least equally well the function and achieve the results intended by the design concept of the completed Project as a functioning whole; and

3) it has a proven record of performance and availability of responsive service; and

4) it is equal or better in form, features, operation and maintenance cost and general configuration; and

5) it conforms to the requirements of the Contract Documents in all respects, except for make and manufacturer or supplier and minor details of specified equipment; and

b. Contractor certifies in writing that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances. Applications for approval of substitute items of material or equipment will not be accepted by the Engineer if made as part of a Shop drawing submittal. The application for use of substitute material or equipment must be made prior to the submission of a shop drawing by a written communication clearly labeled "Request for Substitution". Substitute items proposed by Shop Drawings for materials or

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equipment will be rejected by the Engineer unless previously approved in a separate application.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified; and

d) Contractor accepts the installation instructions, warranty and correction obligations contained in the product manufacturer's literature in connection with the proposed substitution as if such, information pertaining to the new product was originally specified in the Contract Documents; and

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

b) 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

c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty; and

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services; and

4) And shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

e. If a proposed substitution affects a correlated function, adjacent construction, or the work of other contractors, then the necessary changes and modifications to the affected work are considered an essential part of the proposed substitution, to be accomplished by Contractor as a part of the Work, if and when approved.

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B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

1. Proposed substitutions may be rejected without explanation and will not be considered unless one or more of the following conditions exists:

    a. Required for compliance with interpretation of code requirements or insurance regulations then existing.

    b. Unavailability of specified products, through no fault of Contractor.

    c. Subsequent information discloses inability of specified products to perform properly or to fit in designated space.

    d. Manufacturer/fabricator refuses to certify or guarantee performance or specified product as required.

    e. When in the judgment of Owner or Engineer, that a substitution would be substantially to Owner's best interests, in terms of cost, time, or other considerations.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Contractor shall be liable to Owner for any and all costs and expenses (including, but not limited to, Engineer's fees and expenses) incurred by Owner as a result of evaluating a substitute proposed or submitted by the Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B, and reflecting changes in the Contract Documents, whether or not Engineer approves a substitute so proposed or submitted by Contractor. Contractor covenants and agrees that Owner may retain, deduct, and/or offset monies due to Owner pursuant to this Paragraph 6.17.D.4 from monies due to Contractor under the Agreement. Contractor further covenants and agrees that Owner retains the right to make such deduction or offset at any time prior to and including final payment and that the imposition and the deduction and/or offset of such monies shall not be subject to any notice or claim provisions of the Contract Documents. Such payment is an obligation separate and apart from the Contractor's obligation to pay liquidated damages for delay, if any.

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F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

B. As part of the Bid or the Proposal, the Owner may require the identity of the Contractor's proposed Subcontractors and Suppliers of Equipment or Materials in order to better evaluate the Proposal or Bid. In the instance where identification of Suppliers is required, supply only one name per equipment or material item.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Owner or Engineer may furnish to any such Subcontractor, Supplier, or other individual, entity, or organization, to the extent practicable, information about amounts paid to Contractor for Work performed. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any Monies due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

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E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade. Owner and Engineer assume no responsibility for the overlapping or omission of parts of the Work by various Subcontractors or Suppliers in their subcontracts with the Contractor, as this is solely the Contractor's responsibility.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured's or loss payees (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 any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same. This Waiver of Subrogation provision shall survive the completion and/or termination of this Agreement.

H. As soon as possible, but in no case more than 30 days after receipt of the Notice of Award, and prior to the first application for payment, the Contractor shall provide the Engineer with a list of sub-contractors along with the division of their work.

6.07 *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.

B. 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.

6.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees

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necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *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. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear 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. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Paragraph 10.05.

6.10 *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.

B. A certified sales tax statement shall be provided with each and every pay application, even if there were no sales tax during that period.

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

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3. 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 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 by or based upon Contractor's performance of the Work.

4. Only materials and equipment that are to be used directly in the Work shall be brought to and stored on the Project site by Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. If Contractor uses any portion of the new Work prior to the date of Substantial Completion of the entire Work, such items shall be restored to their new condition.

B. *Removal of Debris during Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall 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 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 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 property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction including, but not necessarily limited to, (i) deviations from the Drawings and Specifications made during construction; (ii) details in the Work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on the Drawings; (iv) the actual installed position of all mechanical, electrical equipment, piping, ductwork, access panels, valves, drains, stub outs, etc.; and (v) such other information as Owner or Engineer may reasonably request. These record documents together with all approved samples and a counterpart of all approved Shop Drawings will be available to Engineer and Owner for reference. Contractor's Record Documents shall be available for review by Engineer as part of the pay application process. A pay application will not be considered until the Record Documents are shown complete through that application period. Upon completion of the Work, these Record Documents, Samples, and Shop Drawings will be delivered to Engineer for Owner. Final payment and any retainage shall not be due and owing to Contractor until the Record Documents, marked by Contractor, as required above are delivered as required above.

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6.13 *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. 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, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. 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. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any.

D. 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.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.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 (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).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Nothing contained in the Contract Documents shall be construed to require or authorize Engineer or Owner to supervise or be in any way responsible for Contractor's compliance with any applicable safety regulations, codes, or procedures. Engineer and Owner shall have no duty to

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inform the Contractor of any safety violations, and should Engineer or Owner voluntarily point out safety violations, such actions shall not be construed to mean that Engineer or Owner has assumed any responsibility for Contractor's compliance with any applicable safety regulations, codes, or procedures. Contractor is solely responsible for Project safety.

H. Contractor shall promptly report in writing to Owner and Engineer all accidents arising out of or in connection with the Work that cause death, personal injury, or property damage, giving full details and statements of any witnesses.

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

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

6.16 *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 threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07) and the submittal procedures described elsewhere in these Contract Documents. In the event of any conflict between the submittal procedures noted above and this Paragraph 6.17, the more stringent requirements shall control. Each submittal will be identified as Engineer may require. Contractor represents and warrants that all Shop Drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the Shop Drawing is prepared and, if required by the Contract Documents or applicable Laws or Regulations, be a licensed architect or engineer, as appropriate.

1. *Shop Drawings:*

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to

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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 6.17.D.

2. *Samples:*

a. Submit number of Samples specified in the Specifications.

b. 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 6.17.D.

B. 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. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples. Engineer's review and approval will be only to determine if the items covered by the submittals will, after

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installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. Engineer's review is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance responsibility of Contractor as required by the Contract Documents. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Except as otherwise expressly provided herein, Engineer's approval of any submittal shall not in any way be deemed to release Contractor from full responsibility for complete and accurate performance of the Work in accordance with the Contract Documents; neither shall such approval release Contractor from any liability imposed upon Contractor by any provision of the Contract Documents. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.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's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

4. Contractor acknowledges that the processing of Shop Drawings and other submittals often requires extensive and time-consuming reviews by many individuals and that the time required for such reviews are directly related to the clarity, completeness, and accuracy of such submittals. Contractor covenants and agrees that Contractor's responsibilities include, but are not limited to, reviewing and coordinating each submittal with all other related or affected work and approving each submittal before submitting same to Engineer for approval. As a part of its Basic services to Owner, Engineer will review up to two submissions of all Contractor submittals required by the Contract Documents. However, if Engineer is required to:

a. review a third or subsequent submission of any submittal, or

b. review more than the number of copies of each submittal specified in the Contract Documents, or

c. review submittals in addition to those required by the Contract Documents, or

d. review submittals for proposed substitutions for previously approved items, then

Contractor shall be liable to Owner for any and all costs and expenses (including, but not limited to, Engineer's fees and expenses) incurred by Owner as a result thereof. Contractor covenants and agrees that Owner may retain, deduct, and/or offset Monies due to Owner pursuant to this Paragraph 6.17.D.4 from monies due to Contractor under the Agreement.

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Contractor further covenants and agrees that Owner retains the right to make such deduction or offset at any time prior to and including final payment and that the imposition and the deduction and/or offset of such monies shall not be subject to any notice or claim provisions of the Contract Documents. Contractor acknowledges that this obligation is separate and apart from the obligation to pay liquidated damages for delay, if any.

E. *Resubmittal Procedures:*

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.

F. *Professional Certification:*

1. When professional certification of performance criteria of materials, systems, or equipment is required by the Contract Documents, Contractor shall provide the person or party providing the certification with full information on the relevant performance requirements and on the materials, systems, or equipment that are expected to operate at the Project site. The certification shall be based on performance under the operating conditions generally prevailing or expected at the Project site. Engineer shall be entitled to rely upon the accuracy and completeness of such certification.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing. Contractor's refusal or failure to continue with the Work in a timely manner as a result of any dispute that arises will constitute a material breach of the Agreement. Owner shall be entitled to specific performance of provisions requiring delivery of warranties and other required documentation.

6.19 *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 and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee. Unless otherwise stipulated elsewhere within the Contract Documents, the Contractor's warranty period will begin at Owner's acceptance and remain in effect for a period of 12 months. If an equipment or material failure occurs during the Contractor's warranty period, the Contractor's warranty period shall be extended by a period of time, equal to the down time of the equipment, or time until the material failure was corrected to the Owner's satisfaction.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

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1. abuse, modification, or improper 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.

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

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 or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor and Subcontractor(s) (the "Indemnitors") shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, insurers, agents, consultants and subcontractors of each and any of them (the "Indemnitees") 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, resulting from, or relating to the Contractor's or its employees', agents' or Subcontractors' (or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable) actions, activities or omissions, negligent or otherwise, or breach or failure to perform this Agreement on or near Owner's property or easement, or arising in any way out of, resulting from, or relating to any of the Work to be performed under this Contract, including, without limitation, claim for bodily injuries, sickness, disease, or death, or to injury to or destruction of tangible property, or other economic damages such as fines, penalties, or other losses, including the loss of use resulting therefrom, except such obligation shall not require indemnity in favor of any party whose negligence solely call such loss. To the extent that any portion of this provision is deemed contrary to law or to otherwise be unenforceable, the parties agree that such offending portion or portions shall be severed from this provision and the remaining provisions shall be enforceable to the maximum extent permitted at law. In the event of any conflict in the construction of this provision, the parties agree that the interpretation requiring the fullest obligation and indemnity shall prevail.

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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 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, and Contractor expressly waives any right to any such limitation. Contractor shall include in any and all subcontracts a provision requiring each Subcontractor to likewise waive any limitation on amount or type of damages, compensation, or benefits payable for or to the Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. Contractor's indemnity obligations under this Paragraph 6.20 shall also specifically include, without limitation, all fines, penalties, damages, liability, costs, expenses (including, but not limited to, reasonable fees and charges of engineers, architects, attorneys, and other professionals, and all court or mediation or other dispute resolution costs), and punitive damages (if any) arising out of, or in connection with, any (i) violation of or failure to comply with any law, statute, ordinance, rule, regulation, code, or requirement of a public authority that bears upon the performance of the Work by Contractor, a Subcontractor, or any person or entity for whom either is responsible, specifically including, but not limited to, any violations of the federal Occupational Safety and Health Act (as applied in the state in which the Project is located or any of the Work is performed) or the safety requirements under Article 6 of these Modified General Conditions; (ii) means, methods, procedures, techniques, or sequences of execution or performance of the Work; and (iii) failure to secure and pay for permits, fees, approvals, licenses, and inspections as required under the Contract Documents, or any violation of any permit or other approval of a public authority applicable to the Work, by Contractor, Subcontractor, or any person or entity for whom either is responsible.

D. Contractor shall indemnify and hold harmless all of the Indemnities from and against any and all costs and expenses (including, but not limited to, reasonable fees and charges of attorneys) incurred by any of the Indemnities in enforcing any of Contractor's defense, indemnity, and hold-harmless obligations under this Contract.

E. No contention by Contractor that a certain claim is beyond its indemnity obligations herein required shall relieve Contractor of the obligation to provide indemnity until final judgment by a court of competent jurisdiction holding that there exists no duty on the part of Contractor to undertake any indemnity obligation under the circumstances of any particular claim.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures or safety precautions and programs in connection with the Work.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents,

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Owner and Engineer will specify all performance and design criteria of which the Owner and Engineer have knowledge that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional, whom shall comply with reasonable requirements of the Owner regarding qualifications and insurance. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria of which the Owner and Engineer have knowledge that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. (Intentionally deleted)

6.22 *Owner-Purchased Material and Equipment*

A. Contractor accepts assignment of, and liability for, all purchase orders and other agreements for procurement of Owner-purchased materials and equipment that are identified as part of the Contract Documents, if any. Contractor shall be responsible for any such pre-purchased items as if Contractor were the original purchaser. The Contract Price shall include, without limitation, all costs and expenses in connection with delivery, handling, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. All warranty and correction of the Work obligations under the contract documents shall also apply to any pre-purchased items, unless the Contract Documents specifically provide otherwise.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefore, or have other work performed by utility owners that does not unreasonably interfere with Contractor's Work.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. 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

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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.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to 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.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Contract Documents:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

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

B. Unless otherwise provided in the Contract Documents, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. (Intentionally deleted)

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

7.04 *Claims between Contractors*

A. Should Contractor cause damage to the Work or property of any other contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any other contractor against Contractor, Owner, Engineer, or the construction coordinator, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law.

B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify, defend, and hold harmless Owner and its officers, directors, partners, employees, agents, consultants, and subcontractors from and against all liabilities, claims, causes of action, suits of any nature, fines, penalties, expenses, costs, losses, and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, or, indirectly, out of any controversy arising between Contractor any other contractor

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oversight, including, without limitation, any action, legal or equitable, brought by any other contractor against Owner to the extent said claim is based on or arises out of Contractor's performance of the Work. Should the presence of another contractor at the Site give rise to any other Claim, Contractor agrees its sole remedy with respect to such claim shall be against the of the contractor and Contractor agrees it shall not institute any action, legal or equitable, against owner or its officers, directors, partners, employees, agents, consultants, and subcontracts, or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter, which seeks to impose liability on or to recover damages from Owner or its officers, directors, partners, employees, agents, consultants, and subcontractors on account of any such damage or Claim.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *(Intentionally deleted)*

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

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8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *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.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *(Intentionally deleted)*

8.12 *(Intentionally deleted)*

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *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 Documents and will not be changed without written consent of Owner and Engineer. Except for those responsibilities of the Engineer to decide matters in dispute between the Owner and contractor, the Engineer's services are being performed solely for Owner's benefit, and no other party or entity shall have any claim against Engineer because of the performance or non-performance of such services.

9.02 *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. No act or omission of the Engineer and performing observation of the Work shall r relieve the Contractor of its primary obligation to perform Work in strict accordance with the Contract Documents. No deviation from the

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Contract Documents shall be deemed to be conforming Work and unless documented in a written Change Order signed by all Parties, except as provided for minor deviations which may be addressed by Field Orders as set forth below.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. 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.

9.03 *Construction Field Representative (CFR)*

A. Engineer may furnish a CFR to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such CFR and assistants will be as provided in the Contract Documents, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Contract Documents.

B. Limitations of Authority: Contractor shall have no right to rely on the CFR in performing any of the following unless Contractor first receives a written instructions of the Engineer and otherwise the CFR shall not:

1. shall not undertake any of the responsibilities of the Contractor, the Subcontractors, or the Contractor's superintendent;

2. shall not authorize any deviation from the Contract Documents;

3. shall not stop Work;

4. shall not expedite the work for the Contractor;

5. shall not advise on or issue directions relative to any aspect of the means, methods, techniques, safety, sequences, or procedures of construction;

6. shall not authorize the Owner to occupy the Project in whole or in part;

7. shall not participate in the performance of specialized field or laboratory tests.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If

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Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefore as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

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

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. 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, subject to the provisions of Paragraph 10.05.

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

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 21 days of the event giving rise to the question in accordance with the provisions of Paragraph 10.5 with a request for formal decision.

1. In connection with Contractor's responsibilities with respect to requests for information (RFIs), see Paragraph 3.03.A.2.a and 3.03.A.2.b.

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B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision with respect to any such Claim will be a condition precedent to any exercise of rights or remedies a party may have under law.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision unless either party proves, by the preponderance of the evidence, that Engineer's decision was made arbitrarily and capriciously, with no evidence whatsoever to support Engineer's decision.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty 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. As a condition of the Contractor accepting the right to perform the Work required under this Agreement, the Contractor on behalf of itself, its subcontractors, employees, sureties, and assigns does prospectively release any such claim as to Engineer and Contractor agrees its sole remedy shall be under the Contract to request additional time and compensation from the Owner in strict accordance with the provisions of this Agreement.

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. Neither the professional activities of Engineer, nor the presence of Engineer or its employees or consultants at the Project site, shall relieve Contractor of its obligations, duties, and responsibilities under the Contract Documents.

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 Paragraph 14.07.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.

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E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Construction Field Representative, if any, and assistants, if any.

9.10 *(Intentionally deleted)*

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *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 by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided). A change in the Contract Price or the Contract Times shall be accomplished only by a written Amendment, a written Change Order, or a written Work Change Directive. Contractor waives the right to additional compensation or time unless it first obtains such documents, properly executed by the appropriate parties, prior to performing any additional Work. No course of conduct or dealings between the parties, no expressed or implied acceptance of alterations or additions to the Work, and no claim that Owner has been unjustly enriched by any alterations or additions to the Work shall be the basis of any claim for an increase in any amount due under the Contract Documents or a change in any time period provided for in the Contract Documents unless such written documentation is obtained, as such written documentation is a condition precedent to the Contractor's recovery of additional money or time.

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefore as provided in Paragraph 10.05.

10.02 *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 as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A, or otherwise nonconforming work or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

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2. changes in the 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; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

B. Agreement on any Change Order shall constitute a full and final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect (including without limitation delay, disruption, impact, loss of efficiency, and extended overhead) costs associated with such change, or the cumulative effect of changes through the date of the subject Change Order, and any and all adjustments to the Contract Price and the Contract Times. Implied in every Change Order, unless expressly reserved by Owner or Contractor, is a waiver of all known and unknown claims arising out of or otherwise associated with the Change Order, including a waiver of an applicable federal or state anti-claim waiver statute or common law principal of similar effect. In the event a Change Order increases the Contract Price, Contractor shall include the Work covered by such change Order in Applications for Payments as if such Work were originally part of the contract Documents.

10.04 *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. Owner shall be charged with responsibility for enforcing this provision.

B. Contractor shall keep the surety informed of the progress of the Work, and, where necessary, obtain the surety's consent to, or waiver of, (i) notice of changes in the Work; (ii) request for reduction or release of retention; (iii) request for final payment; and/or (iv) any other item required by the surety. Owner shall be notified by Contractor and shall be carbon copied, in writing, with all communications between the Contractor and the surety. Owner may, in Owner's sole discretion, inform the surety of the quality and progress of the Work and obtain consents as necessary to protect Owner rights, interest, privileges, and benefits under and pursuant to any bond issued in connection with the Work.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

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B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 21 days) after the start of the event giving rise thereto; provided, however, that the claimant shall use its best efforts to furnish Engineer and the other party, as expeditiously as possible, with notice of any Claim including, without limitation, those in connection with concealed or unknown conditions, once such Claim is recognized, and shall cooperate with Engineer and the party against whom the Claim is made in any effort to mitigate the alleged or potential damages, delay, or other adverse consequences arising out of the condition that is the cause of such a Claim. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. Deny the Claim in whole or in part;

2. Approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05. C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

1. The notice required by Paragraph 10.05.B is a condition precedent to the assertion of any claim by Contractor. The right of Owner to receive written notice of claims under Paragraph 10.05.B may not be waived or modified by Owner or Engineer except in writing signed by Owner, and Contractor waives the right to rely on any purported waiver of this written notice by verbal instructions or other conduct of Owner or Engineer.

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2. Contractor's written notice of a Claim shall be made by written request seeking a Change Order and specifying the grounds therefore and the relief sought. Contractor shall attach to each Application for Payment a schedule of outstanding and unresolved Contractor Claims. By attaching and submitting such schedule with its Application for Payment, Contractor shall be deemed to have certified that the only outstanding and unresolved Claims of which it has notice at the time of the Application for Payment are those identified in the schedule attached to its Application for Payment. A schedule of outstanding and unresolved requests for change orders and claims shall be required of each Subcontractor submitting an application for payment to Contractor that is to be included in Contractor's Application for Payment to Owner. Owner and Engineer shall each rely upon Contractor's schedule of outstanding and unresolved Claims as inclusive of any and all Claims Contractor is then on notice of, and Contractor's acceptance of payment in response to an Application for Payment shall constitute a waiver and release of any and all Claims not identified in Contractor's schedule of outstanding and unresolved Claims not identified in Contractor's schedule accompanying such Application for Payment. Contractor shall require that each Subcontractor waive and release any and all requests for change orders and claims the Subcontractor is on notice of at the time it submits its application for payment to Contractor and which is not identified in its application for payment by acceptance of payment from Contractor.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall 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. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall 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 shall accrue to Contractor unless Owner deposits

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funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall 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, who 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 shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work, but only to the extent authorized and approved by Owner in writing before such charges and expenses are incurred.

5. Supplemental costs including 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, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

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 property insurance established in accordance with Paragraph 5.06.D), 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

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whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone 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 Contractor are required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

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

4. 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.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

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11.02 *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:*

1. Contractor agrees that:

a. 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

b. 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 on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a 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 on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *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. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

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. Unless otherwise stipulated in the Contract Documents, for Unit Price Work, Contractor shall be paid an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the actual quantity of each item as determined by the Engineer pursuant to paragraph 9.07. Variations between the actual quantity and the estimated quantity for items of Unit Price Work, including increases and decreases in quantities, as a result of any Change Orders, shall not serve as a basis for an adjustment in the unit price of the item.

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ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

1. If Owner is entitled to reimbursement or payment from Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand of Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if Contractor fails to promptly make any payment due Owner, or Owner incurs any costs and expenses to cure any default of Contractor or to correct defective Work, Owner shall have an absolute right to offset such amount against the Contract Price and may, in Owner's sole discretion, elect either to (1) deduct an amount equal to that which Owner is entitled from any payment then or thereafter due Contractor from Owner, including payment of retainage, or (2) issue a written notice to Contractor reducing the Contract Price by an amount equal to that which Owner is entitled.

B. The value of any Work covered by a Change Order or of any Claim for 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, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to new unit prices or a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall 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 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

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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 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. where Work is deleted from the Contract prior to commencement of that Work without substitution of other similar Work, one hundred percent (100%) of the Contract cost attributable to the Work, plus a Contractor's markup of ten percent (10%) on the amount of deleted cost, shall be deducted from the Contract Price. However, in the event that material submittals have been approved and orders placed for said materials, a lesser amount equal to the greater of (i) one hundred percent (100%) of the Contract cost attributable to the deleted Work, minus reasonable order cancellation, material restocking, and similar fees, plus a Contractor's fee of five percent (5%) on the amount of deleted cost, or (ii) eighty percent (80%) of the Contract Price shall be deducted from the Contract Price. The credit to the Owner as a result of deletions in the work which results in a for reduced premiums on labor and material bonds, payment and performance bonds shall in all cases be one hundred percent (100%) of the reduction in premium. When both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

f. To the extent the Owner performs work as a result of any omission or breach of the Contractor, the Owner shall be entitled to an overhead mark-up consistent with the provisions set forth in this section.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times may be extended in an amount equal to the time lost due to such delay if a Claim is made therefore as provided in Paragraph 12.02.A and if the performance of the Work is not, was not, or would not have been delayed by any other cause for which the Contractor is not entitled to an extension of the Contract Times under the Contract Documents. Delays beyond the control of Contractor shall include, but not be

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limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God. Contractor acknowledges and agrees that adjustments in the Contract Times will be permitted for a delay only to the extent such delay (i) is not caused, or could not have been anticipated, by Contractor; (ii) could not be limited or avoided by the Contractor's timely notice to Owner of the delay or reasonable likelihood that a delay will occur; and (iii) is of a duration not less than one day. In no event will claims for delay be allowed where alleged delays do not impact the critical path of the Contractor as demonstrated on the relevant schedule provided by the Contractor for the period of time in which the delay allegedly occurred.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, 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 the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

1. If a claim is made as provided in Paragraph 12.03.A and this Paragraph 12.03.C for delay due to abnormal weather conditions, the time extension to be awarded to Contractor, if any, shall be calculated using the following standard baseline ("standard Baseline") of monthly anticipated adverse weather delay days for the project location, and extensions shall only be granted for days lost in any given month in excess of the number of days shown in the Standard Baseline for the same given month. The Standard baseline shall be regarded as the established normal and anticipatable number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline shall be included in the Contractor' scheduling of weather-dependent activities and shall not be eligible for extension of Contract Time.

Monthly Contract Allowance (MCA) in days												
Month	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Days	**8**	**6**	**6**	**7**	**5**	**8**	**7**	**5**	**6**	**3**	**5**	**7**

2. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours:

   a. Precipitation (rain, snow, and/or ice) in excess of two-tenths inch (0.20") liquid measure.

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b. Standing Snow in excess of one inch (1.00")

3. Adverse Weather may include, as deemed by Engineer, "dry-out" or "mud" days:

   a. For rain days above the standard baseline,

   b. Only if there is a hindrance to site access or site work such as earthwork; and,

   c. At a rate no greater than one (1) make-up day for each day or consecutive days of rain beyond the standard baseline that total one inch (1.00") or more, liquid measure, unless specifically recommended otherwise by Engineer.

4. Actual adverse weather delay days must prevent work on critical exterior activities for fifty percent (50%) or more of Contractor's scheduled workday. The number of actual adverse weather delay days shall be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather days exceeds the number of days anticipated by the Standard Baseline in Paragraph 12.03.C.1, and providing that all other contractually-required conditions are met, qualifying delays will be converted to calendar days and additional calendar days will be added to the Contract times for each qualifying delay in excess of the Standard Baseline.

5. Upon commencement of on-site activities and continuing throughout construction, Contractor shall be responsible for accurately measuring and recording the daily the occurrence of adverse weather on-site.

6. Within 30 days of the last day of any month (hereinafter referred to as the "Reporting Month"), Contractor shall submit a written Adverse Weather Report, including copies of Contractor's daily weather reports and applicable climatological data from the National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location, unless Engineer allows an additional period of time for submission of said report. Notwithstanding any other provisions, failure to submit the required written report within the time specified above shall be deemed to be and shall constitute a waiver by Contractor of any and all claims for delay due to adverse weather conditions occurring during said Reporting Month.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project. Time extensions due to weather delay shall not entitle Contractor to any claim, compensation, or recovery for extended overhead.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

F. Contractor shall be liable to Owner and shall pay Owner for a percentage of all costs incurred by Owner and Engineer in investigating, analyzing, negotiating, arbitrating, and litigating any claim

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against Owner or Engineer for costs or damages due to any alleged delaying or Contractor in the performance of the Work, which percentage shall be equal to the percentage of Contractor's total delay claim which is determined to be false or to have no basis in law or in fact.

G. To the fullest extent permitted by law, and notwithstanding anything to the contrary in the Contract Documents, an extension of the Contract Time, to the extent permitted under Paragraph 12.02, shall be the sole remedy of Contractor for any (1) delay in the commencement, prosecution, or completion of the Work, (ii) hindrance or obstruction in the performance of the Work, (iii) loss of productivity, or (iv) other similar claims (collectively referred to in this Paragraph 12.03.G as "Delays" whether or not such Delays are foreseeable, unless a Delay is caused by acts of Owner constituting active interference with Contractor's performance of the Work, and only to the extent such acts continue after Contractor furnishes Owner with notice of such interference. In no event shall Contractor be entitled to any compensation with any Delay, including, without limitation, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. Owner's exercise of any of its rights under the Contract Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling, or correction of the Work), regardless of the extent or frequency of Owner's exercise of such rights or remedies, shall not be construed as active interference with Contractor's performance of the Work.

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

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will 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 therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

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2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

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 and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. 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.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

G. Contractor shall be responsible for inspection of portions of the work already performed to determine that such portions are in proper condition to receive subsequent Work. Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms strictly to the Contract requirements. Contractor shall keep full and detailed inspection records and Owner and Owner's authorized representatives shall be afforded access to, and shall be permitted to audit and copy, Contractor's inspection records relating to the Project., and Contractor shall preserve these records for a period of five years after final payment or for such longer period of time as may be required by law.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay 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 uncovering, exposure, observation, inspection, and testing, and of satisfactory

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replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefore as provided in Paragraph 10.05.

D. 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, or both, 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, Contractor may make a Claim therefore as provided in Paragraph 10.05.

13.05 *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, or if the Work interferes with the operation of the existing facility, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay 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 correction or removal (including but not limited to all costs of repair or replacement of work of others). Retesting which is necessary as a result of failed testing or defective work shall be at the Contractor's expense.

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

C. At any time during the progress of the Work and up to the date of final acceptance, the Engineer shall have the right to reject any Work that does not conform to the requirements of the Contract Documents, even though such Work has been previously inspected and paid for. Any omissions or failure on the part of the Engineer to disapprove or reject any Work or materials at the time of inspection shall not be construed as an acceptance of any defective Work or materials.

13.07 *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 terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use

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by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If 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. 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 correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. 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.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, 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.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay 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) 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 pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted.

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If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefore as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *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 rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, 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, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. 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) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefore as provided in Paragraph 10.05. 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 and the Owner's expenses and compensation for the Engineer's additional services made necessary by Contractor's default, neglect, or failure. Contractor covenants and agrees that Owner may retain, deduct, or offset Monies due to Owner pursuant to this Paragraph 13.09.C from Monies due to Contractor under the Contract Documents. Contractor further covenants and agrees that Owner retains the right to make such reduction or offset at any time prior to and including final payment and that the imposition and the deduction and/or offset of such Monies shall not be subject to any notice or Claim provisions of the Contract Documents.

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 13.09.

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ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

B. Detail Breakdown of Contract Amount: except in cases where unit prices form the basis for payment under the Contract, the Contractor shall, in accordance with Paragraph 2.07.3, submit a complete itemization of the Contract Amount showing the value assigned to each part of the work, including an allowance for profit and overhead. Upon approval of the itemization of the Contract Amount by the Engineer, it shall be used as the basis for all Applications for Payment.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At the date established for each progress payment (but not more often than once a month), Contractor shall submit to the Engineer an Application for Payment for Work done and materials delivered and stored on the Site. Each Application for Payment shall be computed on the basis of Work completed on all items listed in the Detail Breakdown of Contract Amount (or on unit prices), less retainage. The Contractor shall furnish the Engineer and Owner all reasonable information required for obtaining the necessary data relative to the progress and execution of the Work. 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 another location agreed to in writing, the Application for Payment shall be accompanied by evidence that the materials and equipment are covered by appropriate property insurance, all of which must be satisfactory to the Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments shall be governed by N.C. General Statute Section 143-134.1.

4. Payment for Stored Materials and Equipment: The following conditions apply to payment for stored materials and equipment allowed by Article 14.02.A.1.:

   a. Except in the instance of a material or equipment item that involves little or no installation cost, payment for stored materials or equipment shall not exceed fifty percent (50%) of the value of the item on the Schedule of Values (for lump sum contracts) or fifty percent (50%) of the value the pay item (for unit price contracts) that covers the materials or equipment being claimed. For material or equipment items that involve little or no installation cost, the percentage of the value of the item that will be paid for stored materials will be as agreed upon by the Engineer, Owner, and Contractor.

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b. Contractor shall submit paid invoices or releases of Lien from the e materials and equipment suppliers with each Application for Payment containing a request for payment for that particular item of stored materials or equipment.

c. Payment for stored materials and equipment is generally intended to apply only to major materials and equipment items, as determined by the Engineer.

5. Each Application for Payment shall be accompanied by the following, all in form and substance in accordance with the Contract Documents and satisfactory to Owner:

a. In accordance with Paragraph 10.05.F.2, a current schedule of outstanding and unresolved Contractor Claims;

b. A current Contractor's lien waiver and duly executed and acknowledged sworn statement showing all Subcontractors and Suppliers with whom contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for an Subcontractor and Supplier in the requested progress payment, and the amount to be paid to Contractor from such progress payment, together with similar sworn statements from all Subcontractors and Suppliers;

c. Duly executed waivers of mechanic's and material man's liens from all Subcontractors and, when appropriate, from Suppliers and lower tier subcontractors establishing payment or satisfaction of payment of all amounts requested by Contractor on behalf of such entities or persons in any previous Application for Payment; and

d. All information and materials required to comply with the requirements of the Contract Documents or reasonably requested by Owner or Engineer.

e. Contractor's social security number (if an independent contractor) or federal employer identification number (if a corporation, partnership, or proprietorship), as appropriate.

f. Contractor shall annotate the record copy of the Drawings to show all changes made each period as a condition for Engineer's recommendation of payment.

g. Contractor shall provide a certified sales tax statement with its pay application.

6. Contractor shall also comply with the following specific requirements:

a. Title to all materials and equipment purchased by the Contractor for the Work shall pass to the Owner at the time Owner makes payment for such materials and equipment. The Contractor shall comply with any procedures established by the Owner to secure, evidence, or establish the Owner's title to such materials and equipment.

b. With each application for payment, Contractor shall submit to Owner a written list identifying each location where materials are stored off the Project site and the value of materials at each location. Contractor shall procure insurance satisfactory to Owner for materials stored off the Project site in an amount not less than the total value thereof.

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c. The consent of any surety shall be obtained to the extent required prior to payment for any materials stored off the Project site.

d. Representatives of Owner and Owner's lender, if any, shall have the right to make inspections of the storage areas at any time.

e. Such materials shall be: (1) protected from diversion, destruction, theft, and damage to the satisfaction of Owner and Owner's lender, if any; (2) specifically marked for use on the Project; and (3) segregated from other materials at the storage facility.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each complete Application for Payment, 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 9.07, 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 Documents; or

b. That Engineer is legally liable or responsible for any defects in the Work performed by the Contractor; or

c. 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.

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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, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the Monies paid on account of the Contract Price, 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 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

e. there are other items warranting a set-off against the amount requested by Contractor, including, but not by way of limitation, errors or overpayments on prior payments to Contractor.

C. *Payment Becomes Due:*

1. Within thirty (30) days after receipt of a Contractor's Request for Payment with Engineer's recommendation, the Owner shall:

a. Pay the Application for Payment as recommended by the Engineer.

b. Pay such other amount as Owner decides is due the Contractor, informing the Contractor and Engineer in writing stating the reasons for paying the amended amount.

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c. Withhold payment informing the Contractor and the Engineer of his reasons for withholding payment.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. 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;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

e. Failure of the Contractor to make payments due to Subcontractors, material suppliers, or employees.

f. Damage to another Contractor or any allegations of damage caused to another Contractor

g. The Owner reasonably believes that the Contractor cannot complete the Work within the Contract Price.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action 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, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

E. Other Payment to Contractor Provisions

1. Credit for Uncorrected Work: Should the Owner direct the Contractor to leave uncorrected Work that has been damaged or that was not performed in accordance with the Contract Documents, an equitable deduction from the Contract Amount shall be made to compensate the Owner for the Uncorrected Work.

2. Payment for Removal of Rejected Work and Materials: The removal of Work and materials rejected in accordance with paragraph 13.06.A of the Modified General Conditions and the re-execution of acceptable work by the Contractor shall be at the expense of the Contractor, and he shall pay the cost of replacing the Work of other contractors destroyed or damaged by

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the removal of the rejected Work or materials and the subsequent replacement of acceptable Work.

a. Removal by Owner: Removal of rejected Work or materials and storage of materials by the Owner, in accordance with paragraph 13.09.A of the Modified General Conditions, shall be paid by the Contractor within thirty (30) days after written notice to pay is given by the Owner. If the Contractor does not pay the expenses of such removal and after ten (10) days written notice being given by the Owner of his intent to sell the materials, the Owner may sell the materials at auction or at private sale and will pay the Contractor the net proceeds therefrom after deducting all the costs and expenses that should have been borne by the Contractor.

14.03 *Contractor's Warranty of Title*

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

14.04 *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 (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall review 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 therefore.

1. If after the performance of such Substantial Completion Review, Engineer determines that the Work is not substantially complete, Contractor shall be liable to Owner for any and all costs and expenses (including, but not limited to, Engineers fees and expenses) incurred by the Owner as a result of each such failed review thereafter.. Contractor covenants and agrees that Owner may retain, deduct, and/or offset monies due to the Owner pursuant to this Paragraph 14.04.B.1 from monies due to Contractor under the Agreement. Contractor further covenants and agrees that Owner retains the right to make such deduction or offset at any time prior to and including final payment and that the imposition and the deduction and/or offset of such monies shall not be subject to any notice or claim provisions of the Contract Documents.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a proposed certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a proposed list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the proposed certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the proposed certificate to Owner, notify Contractor in writing, stating the reasons therefore. If, after consideration of Owner's objections, Engineer considers the Work substantially complete,

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Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised list of items to be completed or corrected) reflecting such changes from the proposed certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the proposed certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the final certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. 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 tentative list.

14.05 *Partial Utilization*

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. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and 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 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

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 therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 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 5.10 regarding property insurance.

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14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is fully complete, inclusive of all requirements of the Contract, 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 is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

1. If after the performance of such final completion inspection, Engineer determines that punch list items, site or project cleanup activities remain or the Work is otherwise not fully complete in accordance with all of the requirements of the Contract Documents, Contractor shall be liable to Owner for any and all costs and expenses (including, but not limited to, Engineer's fees and expenses) incurred by the Owner as a result thereof. Contractor covenants and agrees that Owner may retain, deduct, and/or offset Monies due to the Owner pursuant to this Paragraph 14.06.A.1 from Monies due to Contractor under the Agreement. Contractor further covenants and agrees that Owner retains the right to make such deduction or offset at any time prior to and including final payment and that the imposition and the deduction and/or offset of such Monies shall not be subject to any notice or claim provisions of the Contract Documents.

14.07 *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, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment

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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.

4. Contractor must submit to the Engineer within thirty (30) days of the Final Completion date, all Maintenance and Operating Manuals, schedules, guarantees, equipment test reports, and record drawings noting all changes during construction. Failure to submit all items listed will give cause to the Engineer to deny final payment recommendation to the Owner.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. 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. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

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14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *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 notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefore as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will 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 established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

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2. 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

3. complete the Work as Owner may deem expedient, including hiring contractors on any contractual basis including payment under a cost plus contract

C. If Owner proceeds as provided in Paragraph 15.02.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 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed 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.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 10 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of Monies due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Owner may, at any time, terminate the contract in whole or in part for Owner's convenience and without cause. Termination by Owner under this Paragraph 15.03 shall be by a notice of termination prepared by the Owner and delivered to Contractor indicating intent to terminate for convenience and the effective date thereof.

1. (Intentionally deleted)

2. (Intentionally deleted)

3. (Intentionally deleted)

4. (Intentionally deleted)

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

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C. Upon receipt of a notice of termination for convenience, Contractor shall immediately, in accordance with instruction from Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph 15.03.B:

1. Cease operations as specified in the notice;

2. Place no further order and enter into no further subcontracts for materials, labor, services, or facilities except as necessary to complete continued portions of the Contract;

3. Terminate all subcontracts and orders to the extent they relate to the Work terminated;

4. Proceed to complete the performance of Work not terminated; and

5. Take actions that may be necessary, or that Owner may direct, for the protection and preservation of the Work.

D. Upon such termination, Contractor shall recover as its sole remedy payment of the percentage of the Contract Price equal to the percentage of the Work performed satisfactorily and not previously paid for as determined by the Engineer. Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

E. Owner shall be credited for:

1. Payments previously made to Contractor for the terminated portion of the Work;

2. Claims which Owner has against Contractor under the contract; and

3. The value of the materials, supplies, equipment, or other items that are to be disposed of by contractor that are part of the Contract Price.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner does 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 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven 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 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 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.

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ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

If this project is a State Construction Project and/or for a public Owner, Dispute Resolution shall be governed by RULES IMPLEMENTING MEDIATED SETTLEMENT CONFERENCES IN NORTH CAROLINA PUBLIC CONSTRUCTION PROJECTS adopted February 26, 2002.

If the project is a private project, Dispute Resolution shall be as follows:

A. Either Owner or Contractor, when mutually agreed to by both parties, may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the North Carolina Rules of Mediated Settlement Conferences then in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the Engineer and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

    1. Files for Arbitration in accordance with the N.C. Arbitration Act, which arbitration shall be governed by the current Construction Arbitration rules of the American Arbitration Association; or

    2. Agrees with the other party to submit the Claim to another dispute resolution process;

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

    1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

    2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

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

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17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these Modified 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 Documents. 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.

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

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

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MEET NORTH CAROLINA ONE-CALL CENTER

North Carolina One-Call is a Corporation formed and funded by participating utility companies and municipalities in the interest of community and job safety and improved service through damage reduction to the utilities.

A one call toll free number, **1-800-632-4949**, provides an avenue to all of the participating members from any point within the State of North Carolina.

Anyone proposing to excavate, dig, bore, tunnel, blast or disturb the earth in any manner in which buried utilities may be damaged is requested to call the toll-free number between the hours of 7:00 a.m. and 5:00 p.m., Monday through Friday, forty-eight hours before starting the proposed work.

Within minutes of your telephone call, the participating members will be made aware of your plans and will be given pertinent information that has been provided by you about your planned work. You will be told the names of the participating members from whom you can expect a response. If there are buried facilities in the path of your activity, the route of the utilities will be staked and/or marked at no expense to you. If there are no facilities in the area of the planned work, you will be called or notified by a representative of the participating company accordingly.

Should a non-participating utility operator be serving your area, we recommend that you call them on an individual basis. All utility operators, whether company or municipality, will be provided an opportunity to become a member of North Carolina One-Call.

Naturally, knowing the route of the utilities, the excavator is expected to exercise caution and to avoid damage as the project progresses.

Damage prevention doesn't just happen - it is a planned and orderly process through which each of us can participate - **Yes, we can and will dramatically reduce damages to the utilities in the State of North Carolina! Thanks for your help.**

BEFORE YOU DIG

IN THE INTEREST OF COMMUNITY AND JOB SAFETY

AND IMPROVED SERVICE

CALL NORTH CAROLINA ONE-CALL

1-800-632-4949

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner): City of Bessemer City	From (Contractor): Turner Murphy Company, Inc.	Via (Engineer):
Project: Skyland & Lithium Pump Station Improvements	Contract: Skyland & Lithium Pump Station Improvements	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.: 15.01126

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE..... $ _____

2. Net change by Change Orders..... $ _____

3. Current Contract Price (Line 1 ± 2)..... $ _____

4. TOTAL COMPLETED AND STORED TO DATE
(Column F total on Progress Estimates)..... $ _____

5. RETAINAGE:

a. X _____ Work Completed..... $ _____

b. X _____ Stored Material..... $ _____

c. Total Retainage (Line 5.a + Line 5.b)..... $ _____

6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)..... $ _____

7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)..... $ _____

8. AMOUNT DUE THIS APPLICATION..... $ _____

9. BALANCE TO FINISH, PLUS RETAINAGE
(Column G total on Progress Estimates + Line 5.c above)..... $ _____

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding or Financing Entity (if applicable) (Date)

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Certificate of Substantial Completion

Project:	
Owner:	Owner's Contract No.:
Contract:	Engineer's Project No.:

This [tentative] [definitive] Certificate of Substantial Completion applies to:

☐ All Work under the Contract Documents: ☐ The following specified portions of the Work:

_____

_____

_____

_____

_____
Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

☐ Amended Responsibilities ☐ Not Amended

Owner's Amended Responsibilities:

_____

_____

_____

Contractor's Amended Responsibilities:

_____

_____

_____

_____

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

_____

_____

_____

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer	Date
Accepted by Contractor	Date
Accepted by Owner	Date

TECHNICAL SPECIFICATIONS

PART 1: GENERAL

1.01 SUMMARY OF WORK

A. This project generally includes the following:

The construction of a 20-acre LLDPE landfill cap, including approximately 200,000 cubic yards of earthwork, paved access road construction, installation of an arched culvert over a stream, installation of landfill gas (LFG) and leachate collection piping, raising existing LFG extraction wellheads, installation of a sewerage pump station and force main, stormwater piping, and erosion control measures.

1.02 PROJECT MEETINGS

A. Preconstruction Conference: A preconstruction conference will be scheduled by the Engineer after issuance of the Notice of Award. The Contractor and his major subcontractors shall attend the meeting, which will be chaired by the Engineer or his representative. The purpose of the pre-construction conference will be to discuss administration of the Contract and the execution of work, and to answer any questions relative to performance of work under these Contract Documents. All decisions, instructions and interpretations made at this conference shall be binding and conclusive. The proceedings of this conference will be recorded and copies of the proceeding minutes will be issued to the Contractor for his use and distribution to his subcontractors.

B. Progress Meetings: The Contractor and any subcontractors, material suppliers or vendors whose presence is necessary or requested shall attend meetings, referred to as Progress Meetings, when requested by the Engineer or his representative for the purpose of discussing the execution of work. Each meeting will be held at the time and place designated by the Engineer or his representative. Any decisions, instructions and interpretations at these meetings shall be binding and conclusive on the Contractor and such decisions, instructions and interpretations shall be confirmed in writing by the Engineer or his representative. The proceedings of these meetings will be recorded and the Contractor will be furnished with a reasonable number of copies for his use and for his distribution to the subcontractors, material suppliers and vendors involved.

1.03 PROJECT PAYMENTS AND RETAINAGE

A. The Owner may retain a portion of the amount otherwise due the Contractor. Except as provided elsewhere, the amount retained by the Owner shall be limited to the following:

1. Withholding of not more than 5% of the payment claimed until work is 50% complete.

2. When the contract is 50% complete no further retainage shall be withheld from periodic payments. However, the Owner may reinstate retainage (up to 5%) if they feel the work is unsatisfactory. The Owner may withhold additional retainage as necessary from periodic payments in a sum necessary to maintain total retainage of 2.5% of contract cost through the completion of the project.

3. When the work is substantially complete (operational or beneficial occupancy), the withheld amount shall be further reduced below 5% to only that amount necessary to assure completion.

4. The Owner may accept securities negotiable without recourse, conditions or restrictions, a release of retainage bond or an irrevocable letter of credit provided by the Contractor in lieu of all or part of the cash retainage.

B. For unit price projects, the Contractor may use the "Unit Bid Item Summary" form included at the end of this section, or a similar form that provides the required information.

C. Sales Tax Statement: When requested by the Owner, each request for progress payment submitted by the Contractor shall include a sales tax reimbursement statement. The Contractor shall utilize the form provided at the end of this section, or a similar form that provides the required information and certification.

1.04 SUBMITTALS

A. General: All transmittals from the Contractor shall be accompanied by a transmittal cover form that includes pertinent information related to the project and the particular transmittal. The Contractor shall use the "Transmittal Form" provided at the end of this section, or a similar form that includes the required information.

B. Construction Schedule: The Contractor shall, within ten (10) days after receipt of the Notice of Award, prepare and submit to the Engineer for

approval a practicable construction schedule showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features and the contemplated dates for completing such salient features. The schedule may be in any form, at the option of the Contractor, but shall maintain current with each submittal for progress payment, at least the following information.

1. The various classes and area of work broken down into times projected for submittals, approvals and procurement; times for installation and erection; and times for testing and inspection.

2. The work completed and the work remaining to complete the project.

3. Any items of work which will delay the start or completion of other major items of work so as to delay completion of the whole project.

C. Schedule of Values: For lump sum items, the Contractor shall, within thirty (30) days after the Notice of Award and prior to submitting the first Application for Payment, submit to the Engineer for approval a Schedule of Values for the project. The Schedule of Values shall establish the actual value of the components of the work and, after approval by the Engineer, shall be the basis for the Contractor's Applications for Payment. The Schedule of Values shall include separate line items for all major portions of the work.

D. Material Suppliers and Subcontractor Listings: As soon as possible, but in no case more than 30 days after receipt of the Notice of Award, the Contractor shall supply the names and addresses of all major material suppliers and subcontractors to the Engineer.

E. Shop Drawings and Samples: The Contractual requirements for shop drawings and samples are specified in the General Conditions and in the individual specification sections for each item. The Contractor shall submit shop drawings and samples accompanied by the "Submittal and Routing Form" included at the end of this section. Resubmissions, where required, shall be in accordance with the procedures established for the initial submittal.

F. Record Documents: Record drawings will not be required of the Contractor; however, to enable the Owner to prepare record drawings, the Contractor shall keep a complete and accurate record of changes and/or deviations from the Contract Documents and shop drawings, indicating the work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using prints of the Drawings affected, or the Specifications, with appropriate

supplementary notes. The record set of marked-up Drawings, shop drawings, and Specifications shall be kept at the job site during construction and be available for inspection by the Engineer and the Owner. These marked prints shall be included in the package of final documentation submitted before final payment is required.

1.05 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for delivery, storage and handling of all materials and equipment, unless otherwise noted. All material and equipment shall be shipped to arrive at the job site on the dates indicated on the purchase order. The following information shall be supplied:

1. The contents and bill of lading, number of shipments.
2. The method of shipments.
3. The date of shipment.
4. The name of the construction project.

B. Prior to shipment, all items shall be properly prepared to protect all critical areas from the effects of weather, normal expected transport and on site handling.

C. Items shall be tagged and marked with equipment and/or motor numbers as per the manner stipulated in the purchase order.

D. All spare parts and expendable supplies shall be properly crated, marked, and shipped to the job site on the date specified.

PART 2: PRODUCTS

2.01 EQUIPMENT AND MATERIAL STANDARDS

A. All equipment and materials of construction described in this specification shall meet the more stringent requirements of the applicable codes listed below:

1. OSHA - Occupational Safety and Health Administration.
2. ASTM - American Society for Testing Materials.
3. ANSI - American National Standards Institute.
4. AGMA - American Gear Manufacturers Association.
5. AISC - American Institute of Steel Construction.
6. AWS - American Welding Society.

7. NEC - National Electric Code.

8. NEMA - National Electrical Manufacturers Association.

9. API - American Petroleum Institute.

2.02 QUALITY ASSURANCE

A. All equipment shall, after installation by the Contractor, shall be inspected, tested and started up by a qualified representative of the equipment manufacturer. The Contractor and the manufacturer's representative shall complete the "Equipment Start-up Form" provided at the end of this section and submit the completed form to the Engineer.

B. The listing of a manufacturer in the specifications does not necessarily imply that the manufacturer's standard equipment meets the requirements of the specifications, but that the manufacturer listed has the capability to meet the requirements of the specifications.

PART 3: EXECUTION

3.01 SPECIAL REQUIREMENTS

A. Limits of Construction: The Contractor shall confine all operations and personnel to the limits of construction as shown on the plans. There shall be no disturbance whatsoever of any areas outside the limits of construction nor shall the workmen be allowed to travel at will through the surrounding private property.

B. Construction Superintendent: The Contractor shall place in charge of the work a competent and reliable superintendent, who shall have the authority to act for the Contractor and who shall be accountable to the Engineer. The Contractor shall, at all times, employ labor and equipment sufficient to accomplish the several classes of work to full completion in the manner and time specified.

C. Site Conditions:

1. The Contractor shall maintain the work and project grounds free from rubbish, debris and waste materials during all phases of the work.

2. Immediately upon completion of the work and prior to final acceptance, the Contractor shall remove all rubbish, debris, temporary structures, equipment, excess or waste materials and shall leave the work and project grounds in a neat and orderly condition that is satisfactory to the Engineer and Owner.

3. Haywood County operates a functioning landfill gas extraction, flare, and leachate collection systems at the landfill. Upon completion of construction, the Contractor shall restore operation of all these systems.

4. There is an existing underground fiber optic cable located along the existing access road from the Francis Farm Road to the Administrative, Maintenance, and Bus Garage Facility. Any damage to the fiber optic cable by the Contractor shall be repaired at the Contractor's expense.

D. Right of Entry: The Engineer and his representative will at all times have access to the work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

E. Temporary Construction Services and Facilities: The Contractor shall obtain all necessary permits, licenses, etc. and shall pay all costs incident to the furnishing, installing and maintenance of temporary utility services and facilities required for the duration of the work.

F. Control of Erosion, Siltation, and Pollution:

1. Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes or drains, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum. Fills and waste areas shall be constructed by selective placement to eliminate silts or clays on the surface that will erode and contaminate adjacent streams.

2. The Contractor shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The Contractor shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Contractor shall keep himself fully informed of all such regulations which in any way affect the conduct of the work, and shall at all times observe and comply with all such regulations. In the event of conflict between

such regulations and the requirements of the specifications, the more restrictive requirements shall apply.

3. The Engineer shall have the authority to limit the area over which clearing and grubbing, excavation, borrow, and embankment operations are performed whenever the Contractor's operations do not make effective use of construction practices and temporary measures which will minimize erosion, or whenever construction operations have not been coordinated to effectively minimize erosion, or whenever permanent erosion control features are not being completed as soon as permitted by construction operations.

4. The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project, including, but not specifically limited to, unpaved secondary roads, haul roads, access roads, disposal sites, borrow and material pits, and production sites. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property.

5. The Contractor will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items.

G. Disposal of Materials: Debris and waste materials, including all combustibles, shall be removed by the Contractor from the construction area unless otherwise approved in writing by the Owner or his Representative. Demolition of existing structures shall be disposed of as shown on the drawings.

H. Quantities of Estimate: The estimated quantities of work to be done and materials to be furnished under this Contract shown in any of the documents, including the proposal, are given for use in comparing bids and to indicate approximately the total amount of the contract; and the right is especially reserved, except as herein otherwise specifically limited to, to increase or diminish the quantities as may be reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract.

I. Utility Coordination: The Contractor shall make all necessary arrangements with private and public utility companies to avoid any possible damage to or interruption of utility equipment or service. The Contractor shall be responsible for all inquiries concerning locations of utility lines. Repair of any damage to public or private utilities resulting from this work shall be the responsibility of the Contractor.

J. Construction Surveying: All work shall be constructed in accordance with the lines, grades and elevations shown on the plans or as given by the Engineer in the field. The Contractor shall be fully responsible for maintaining alignment and grade. All principal controlling points and base lines for locating the principal components of the work together with a suitable number of benchmarks adjacent to the work will be provided by the Engineer. From this information, the Contractor shall verify benchmarks and develop and make all detail surveys needed for construction. The Contractor shall protect and safeguard all points, stakes, grade marks, monuments, and benchmarks at the site of the work and shall re-establish, at his own expense, any marks which are removed or destroyed due to his construction operations.

K. Laying Out Work:

1. It is imperative that the Contractor work within the shown rights of way or easements at all times, unless approved otherwise by the property owner and the Engineer.

2. The Contractor shall, at his expense, provide competent engineering survey services and shall provide and maintain accurate, detailed, survey work.

3. The plans and supplementary drawings shall not be scaled and the Contractor must verify all dimensions and elevations at the site prior to proceeding with the work. The Contractor shall also verify existing utility locations prior to purchasing materials affected by these locations.

L. Use of Explosives:

1. If the use of explosives is necessary for the execution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives. Such responsibility shall include, but shall in no way be limited to, all damages arising from all forms of trespass to adjacent property as a result of blasting by the Contractor.

2. All explosives shall be stored in a secure manner, in compliance with all laws, and all such storage places shall be marked clearly "DANGEROUS EXPLOSIVES".

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

N. Safety and Health Regulations:

1. The Contractor shall comply with all Federal, State and Local Safety and Health Regulations including the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (P.L. 91 - 596) and under Section 107 of the Contract Work Hours and Safety Standards Act (P.L. 91-54).

2. The Contractor shall provide continuous, safe access to all properties, both public and private, along the project in all cases where such access will be provided by the completed facility and shall conduct his operations in such a manner that inconvenience to the property owners will be held to a minimum.

O. Equipment and Material Storage: The Contractor shall plan his activities so that all materials and equipment can be stored within the project limits. There shall be no disturbance whatsoever of any areas outside the project limits without the prior approval of the Engineer.

P. Disturbed Areas: All areas disturbed as a result of the work of the Contractor shall be restored to the original or better condition. Reasonable care shall be taken during construction to avoid damage to the Owner's property or that of any adjacent property owner(s).

Q. Tree and Plant Protection: No trees or shrubs except those specifically indicated, shall be removed or trimmed without prior approval from the Engineer. All trees and shrubs within the construction limits to be retained by the Owner shall be properly protected by fencing, posts or other means approved by the Engineer. Where any trees or shrubs are damaged or where limbs are required to be trimmed or removed because of operations under this Contract a qualified horticulturist shall be consulted and the trimming performed in the proper manner. Any landscape plantings severely damaged or which die as a result of the Contractor's operations shall be replaced at no additional cost to the Owner.

R. Temporary Sanitary Facilities: The Contractor shall be solely responsible for furnishing and maintaining temporary sanitary facilities during the construction period. Such facilities shall include but not be limited to, potable water supply and toilet facilities. Such facilities shall be in compliance with all applicable state and local laws, codes, and ordinances and shall be placed convenient to work stations and secluded from public observation. Once the project is completed all temporary sanitary facilities shall be removed by the Contractor.

S. Traffic Maintenance:

1. Vehicular access to the Administration, Maintenance, and Bus Garage Facility must be maintained throughout construction during business hours, Monday through Friday.
2. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient warning lights, danger signals, and signs, shall provide a sufficient number of flagmen to direct the traffic and shall take all necessary precautions for the protection of the work and the safety of the public.
3. All barricades and obstructions or hazardous conditions shall be illuminated as necessary to provide for safe traffic conditions.
4. Warning and caution signs shall be posted throughout the length of any portion of the project where traffic flow is restricted.

3.02 WEATHER DELAYS

A. Extensions of Contract Time for Abnormal Weather:

1. If the basis exists for an extension of time in accordance with article 12.03 of the Standard General Conditions of the Construction Contract, an extension of time on the basis of Abnormal Weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for the period of the contract.
2. In the event adverse weather other than those conditions described in Section C, “Adverse Weather and Rain Delay Days”, delays construction activity, such as temperature extremes. The baseline must be adjusted to reflect the number of expected days as described in Section D, “Development of Adverse Weather Baseline”.
3. In order to determine precipitation at the contract site the contractor shall maintain a rain gauge on site. The rain gauge should be read daily and documentation of Adverse Weather Days should be coordinated with the Engineer’s Representative.

B. Standard Baseline for Average Climactic Range:

1. The Engineer has reviewed weather data available from the National Oceanic and Atmospheric Administration (NOAA) and determined a Standard Baseline of average climatic range for the City of Asheville, North Carolina. In the event that the standard baseline for the construction site differs significantly from the Asheville, North Carolina Standard Baseline, it will be the

Contractor's responsibility to provide documentation of said differences.

2. Standard Baseline shall be regarded as the normal and anticipatable number calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

3. Standard Baseline is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	6	6	7	5	8	7	5	6	3	5	7

C. Adverse Weather and Rain Delay Days:

1. Adverse Weather is defined as the occurrence of one or more of the following conditions which prevents exterior construction activity or access to the site within twenty-four (24) hours:

   a. Precipitation (rain, snow, and/or ice) in excess of two-tenths inch (0.20") liquid measure.

   b. Standing snow in excess of one inch (1.00").

2. Adverse Weather may include, if appropriate, "dry-out" or "mud" days:

   a. For rain days above the standard baseline,

   b. Only if there is a hindrance to site access or site work such as excavation, backfill, footings; and,

   c. At a rate no greater than 1 make-up day for each day or consecutive days of rain beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Engineer.

3. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day, including a weekend day or holiday if the Contractor has scheduled construction activity for that day.

D. Development of Adverse Weather Baseline:

1. Development of Adverse Weather Data – This is the process of collecting, compiling and analyzing the raw weather data (NOAA and other sources) that forms the baseline for estimating anticipated delays and project durations and determining the occurrence of unusually severe weather. The following actions make up the development process:

   a. Analyze the project scope and site geography to determine which weather parameters (temperature, precipitation, wind, etc.) are applicable. The parameters selected should present adverse conditions that could potentially delay construction activities.

   b. Review the technical specifications to determine the numerical values that will be assigned to each parameter in order to establish the anticipated adverse weather. Usually when two or more construction phases are affected by the same parameter, the less severe numerical value should be used (i.e. if roofing work is delayed by temperatures below 40 degrees and concrete work is delayed by temperatures below 32 degrees, then the numerical value used to define adverse weather should be 40 degrees unless some other factor renders the roofing phase insignificant in terms of schedule criticality).

   c. Compile the number of days per month that the anticipated weather is expected to be adverse by analysis of NOAA or other weather data. When at all possible, the last 10 years of consecutive data should be used to establish the baseline. However, in the absence of 10 years of data, a shorter period may be used. It may be necessary to extrapolate the number of calendar days that the temperature is expected to fall below the selected numerical value (say, 40 degrees) from raw data.

   d. Adverse weather data must be periodically updated in order to reflect changes in the 10-year averages and incorporate any necessary corrections derived from actual field experience. It is recommended that data used for establishing adverse weather baselines be reviewed annually.

3.03 PROJECT CLOSE-OUT

A. Final Documentation: Prior to final payment, and before the issuance of a final certificate for payment in accordance with the provisions of the General

Conditions, the Contractor shall file with the Engineer the documents listed hereinafter:

1. Guarantees: The Contractor's one (1) year guarantee required by the General Conditions and all other guarantees stated in the Specifications.

2. Affidavit and Waiver of Liens: As required by General Conditions. The Contractor shall utilize the form provided at the end of this section.

3. Consent of Surety Company to Final Payment.

4. Project Record Documents: Record documents shall be as specified in Section 01200-1.04.F.

B. Submittals: The above records shall be arranged in order, in accordance with the various sections of the Specifications, and properly indexed. At the completion of the work, the Contractor shall certify by endorsement thereof that each of the revised and marked-up prints of the Drawings and Specifications is complete and accurate.

C. No review or receipt of such records by the Engineer or the Owner shall be a waiver of any change from the Contract Documents or the shop drawings, or in any way relieve the Contractor of his responsibility to perform the work as required by the Contract Documents, and the shop drawings to the extent they are in accordance with the Contract Documents.

END OF SECTION

(Recommended Standard Forms follow)

TRANSMITTAL FORM

( ) Shop Drawings
( ) Printed Materials
( ) Other

Transmittal Date: _____

Return Date: _____

REFERENCE: _____
Project
_____
Owner
_____
Address
_____
Location

FOR: ( ) Transmittal Only
( ) Approval
( ) Approved as noted
( ) Revise & Resubmit

FROM: _____
Name
_____
Company
_____
Address
_____
telephone/fax

TO _____
Name
McGill Associates, P.A.
Company
P.O. Box 2259, Asheville, NC 28802
Address
_____
telephone/fax

Log #	Description	Copies	Sheet/Drawing #	Status

Project Ref. No. _____

By: _____
Signature

transmit.doc

McGill ASSOCIATES

ATTENTION: CONSTRUCTION ADMINISTRATION

SUBMITTAL AND ROUTING FORM

(TO BE USED WITH EACH INDIVIDUAL PLAN SUBMITTAL OR SHOP DRAWING)

SUBMITTAL AND APPROVAL (Contractor to complete)

Project Name: _____ McGill Project #: _____

Contractor: _____ Submittal #: _____

Contract for: _____ Specification Section: _____

Submittal Title: _____

Sheet/item numbers: _____

_____

_____

Subcontractor: _____ Supplier: _____

Date Transmitted: _____ Date Needed: _____

Change from Contract Documents? Yes ____ No ____ Attached documentation: _____

Complete Submittal? Yes ____ No ____ _____

The Contractor must review and approve this submittal for all requirements and conformance to Contract documents prior to submittal to McGill Associates. Submittals forwarded without the Contractor's approval will be returned without review or comment.

Reviewed by: _____ Date: _____

McGILL ASSOCIATES SUBMITTAL ROUTING (McGill to complete)

Date Received: _____ Logged by: _____ To: _____ Return by: _____

REVIEW CODES: 1 = **Approved**: 2 = **Approved as Noted**: 3 = **Revise & Resubmit**: 4 = **Not Approved**

Reviewed by (in order)	Review Code	**COMMENTS**	Date	Initials

Project Engineer's approval: _____ Date _____

CONTRACTOR'S FINAL AFFIDAVIT AND WAIVER OF LIEN

PROJECT: _____ OWNER: _____

_____ _____

_____ _____

CONTRACTOR: _____

_____

_____

CONTRACT AMOUNT: _____

STATE OF: _____ CONTRACT DATE: _____

COUNTY OF: _____ DATE: _____

This is to certify that all claims for labor, material, services and any other just claims arising out of the performance of this Contract have been satisfied, except for payment to subcontractors to be made out of retainage presently being held by the Owner, and that no claims or liens exist against this Contractor in connection with this contract; that to the best of our knowledge no claims or liens exist, and if any such claims or liens appear after payment of the retained amount due on the Contract, this Contractor shall save the Owner harmless on account thereof. After payment of the retained amount the undersigned does hereby waive, release and relinquish any and all claims or rights of lien presently held or hereafter accruing upon the above project.

CONTRACTOR: _____

BY: _____

TITLE: _____

Sworn to and subscribed before me this

_____ day of _____ 200 _____

_____

(Notary Public)

My Commission expires: _____

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SECTION 013000 MEASUREMENT AND PAYMENT

013000.1 SCOPE

This section covers the method of measurement and payment for items of work under this contract.

013000.2 GENERAL

The total Bid Price for each section of the contract shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the Bid Schedule shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

013000.3 ESTIMATED QUANTITIES

All estimated quantities stipulated in the Bid Schedule or other Contract Documents are approximate and are to be used only a) as a basis for estimating the probable cost of the work and b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. In some cases a unit price item has been added to the bid schedule for the purpose of establishing a cost basis in the event work associated with that item is required. No guarantee is expressed or implied that the quantities shown in the bid schedule shall be required to fulfill the Contract. The basis of payment for work and materials will be the actual amount of work done and materials furnished. The Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts thereof.

013000.4 WORK ITEMS

The following describes the method of measurement and payment for the bid items shown in the Bid Schedule. Lump sum and/or unit prices may be further broken down in a Schedule of Values submitted by the Contractor for payment purposes as approved by the Engineer.

SECTION A – BASE BID

ITEM 1 – MOBILIZATION/GENERAL REQUIREMENTS

Partial payments for the item "Mobilization" will be made with the first and second applications for payment for the contract, and will be made at the rate of 50% of the lump sum price for "Mobilization" on each of these applications for payment. The amount for “Mobilization” in the approved schedule of values shall not exceed 3% of the total project bid. Mobilization shall include all costs for Contractor’s bonds, insurance, temporary facilities, safety measures, survey and layout, general requirements for the contract, and all other miscellaneous costs.

ITEM 2 – DEMOLITION

Work included in this line item of payment shall consist of all demolition shown on the plans or necessary to accommodate new construction.

The quantity of demolition will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will be full compensation for all labor, equipment, and materials necessary for work associated with demolition, including but not limited to, access roads, storm drainage piping and structures, removal of asphalt, removal of concrete, structure demolition, removal and/or grouting of abandoned pipes, rip rap removal, sediment basin baffles, sediment basin riser, miscellaneous structures including walls, utility poles, overhead electrical service, and proper disposal of demolished material on-site as shown on the plans. Demolished fencing will be properly disposed of off-site.

ITEM 3 – CLEARING AND GRUBBING

Work included in this line item of payment shall include all clearing and grubbing within the limits of disturbance shown on the Drawings.

The quantity of clearing and grubbing will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will be the full compensation for all labor, equipment, and materials necessary for clearing and grubbing, tree removal, stump removal, and root removal and proper disposal of material as described in these specifications and/or shown on the Drawings. No compensation will be given for clearing and grubbing outside of the limits of disturbance without prior approval from Engineer. Burning on-site is permitted within the areas shown on the plans.

ITEM 4 – SEEDING, FERTILIZING, AND MULCHING

Work associated with Seeding, Fertilizing and Mulching shall be paid for at the Lump Sum price as listed in the bid schedule. The Owner will retain 20% of the Lump Sum cost until a satisfactory stand of grass has been established on the disturbed areas of the site. The lump Sum price for Seeding, Fertilizing and Mulching shall include all cost for materials, equipment, and labor for providing an acceptable stand of grass on all disturbed areas of the project in accordance with the specifications. The work shall include, but is not limited to, surface preparation, seeding, fertilizer, soil amendments, and mulching.

ITEM 5 – SILT FENCE

Work included in this line item of payment shall include furnishing, installing, maintaining, and removing upon completion silt fence in locations shown on the drawings or as directed by the Engineer.

Payment will be made at the unit price bid per linear foot of silt fence installed and maintained to the satisfaction of the Engineer. Payment will only be made for new silt fence installation. Any additional silt fence required due to maintenance will not be paid.

ITEM 6 – SUPER SILT FENCE

Work included in this line item of payment shall include furnishing, installing, maintaining, and removing upon completion super silt fence in locations shown on the drawings or as directed by the Engineer.

Payment will be made at the unit price bid per linear foot of super silt fence installed and maintained to the satisfaction of the Engineer. Payment will only be made for new super silt fence installation. Any additional super silt fence required due to maintenance will not be paid.

ITEM 7 – CONSTRUCTION ENTRANCE

Work included in this line item of payment shall include furnishing, installing, and maintaining construction entrances per the detail shown in the plans at locations shown on the plans.

Payment will be made at the unit price bid for each construction entrance installed and maintained in accordance with the specifications governing this project.

ITEM 8 – EROSION CONTROL MATTING

Erosion control matting shall consist of North American Green SC150 or approved equal. The quantity of erosion control matting to be paid for will be the actual acreage of matting installed as measured along the surface of the ground at locations per the Drawings or as directed by the Engineer at the contract unit price per square yard. The unit price will be the full compensation for all work including, but not limited to material, equipment and labor for a complete installation as shown on the Drawings or per manufacturer's recommendations. This item includes all erosion control matting shown on the plans and details, including but not limited to, permanent slopes and ditches. This price includes replacement & reinstallation of any areas that must be reseeded to establish permanent vegetation.

ITEM 9 – RIPRAP CHECK DAMS

Work associated with this line item of payment shall include installation of Riprap check dams, and maintenance during construction, as shown on the drawings or as directed by the Engineer.

The quantity of riprap check dams to be paid will be the actual number of check dams installed, and accepted by the Engineer. Quantities greater than shown on the bid tab must be approved by the Engineer prior to placement and payment.

ITEM 10 – WATTLES

Work associated with this line item of payment shall include installation of wattles, and maintenance during construction, as shown on the drawings or as directed by the Engineer.

The quantity of wattles to be paid will be the actual number of wattles installed, and accepted by the Engineer. Quantities greater than shown on the bid tab must be approved by the Engineer prior to placement and payment.

ITEM 11 – PIPE INLET PROTECTION

Work included in this line item of payment shall include furnishing, installing, and maintaining pipe inlet protection at locations shown on the Contract Documents.

Payment will be made at the unit price bid for each pipe inlet protection installed and maintained in accordance with the specifications governing this project.

ITEM 12 – STRUCTURE INLET PROTECTION

Work included in this line item of payment shall include furnishing, installing, and maintaining structure inlet protection at locations shown on the Contract Documents.

Payment will be made at the unit price bid for each structure inlet protection installed and maintained in accordance with the specifications governing this project.

ITEM 13 – TEMPORARY SKIMMER BASINS

Work included in this line item of payment shall consist of construction of all temporary skimmer basins required for erosion control compliance as shown on the Drawings.

Temporary skimmer basins will be paid for at the contract price per each in accordance with the contract documents. The unit price per each will be full compensation for all labor, equipment, and materials necessary to complete the temporary skimmer basins, including but not limited to, installation of riser structures, concrete anti-flotation block, sch40 pvc skimmer barrel, skimmer installation, installation of barrel pipe with anti-seep collars, installation of coir mesh baffles, temporary ditches shown on the drawings or as needed, and maintenance throughout construction. The temporary skimmer basins shall be removed upon projection completion, graded to have positive drainage, and stabilized. Rip rap, washed stone, and filter fabric for spillway weir shall be paid for under item riprap (all types) w/ filter fabric underlayment. The skimmer basin 3 associated with the stream crossing is not included in this item and is included in the stream crossing item. All excavation, filling, & Compacting required to install & remove temporary skimmer basins shall be included in this item.

ITEM 14 – PERMANENT STORMWATER/SEDIMENT CONTROL PONDS

Work included in this line item of payment shall consist of construction of all permanent stormwater/sediment control ponds required for erosion control compliance as shown on the Drawings.

Permanent stormwater/sediment control ponds will be paid for at the contract price per each in accordance with the contract documents. The unit price will be full compensation for all labor, equipment, and materials necessary to complete the permanent sediment basins, including but not limited to, installation of riser structures, concrete anti-flotation block, sch40 pvc skimmer barrel, skimmer installation, installation of barrel pipe with anti-seep collars, installation of rock baffles, temporary ditches shown on the drawings or as needed, and maintenance throughout construction. The

stormwater/sediment control ponds shall be cleaned out upon project completion and restored to match the proposed contours. Rip rap, washed stone, and filter fabric for spillway weir shall be paid for under riprap (all types) w/ filter fabric underlayment. All excavation, filling, & compacting required to install and maintain permanent stormwater/sediment control ponds shall be included in this item.

ITEM 15 – RIPRAP (ALL TYPES) W/ FILTER FABRIC UNDERLAYMENT

This item of work shall include the furnishing and placement of rip rap (all types) w/ filter fabric underlayment, at locations directed by the Engineer and as shown on the Drawings. Rip rap for sediment basin emergency spillways, sediment basin barrel pipe outlet protection, storm drainage pipe outlet protection, ditches, and other miscellaneous spillway riprap shall be paid for under this line item. This item does not include check dams or pipe inlet protection.

The quantity of rip rap measured as provided in the paragraph above, will be paid for at the contract unit price per ton of Rip Rap placed in accordance with the Contract Documents. The Contractor shall furnish copies of certified weight tickets for all material placed on the project. Such prices will be full compensation for excavation, furnishing, hauling, placing, shaping and compacting rip rap, including geotextile fabric underlayment. No additional payment shall be made for rip rap that must be maintained or replaced due to sedimentation.

ITEM 16 – 6’ INNER FENCE

Work associated with inner fence shall be paid for at the unit price per linear foot as listed in the Bid Schedule. The inner fence shall consist of 6’ tall green vinyl coated chain-link fence with top rail and bottom tension wire. The unit price per foot shall include all costs for materials, equipment and labor for supplying and installing inner fence as described in these specifications and/or shown on the Drawings. Inner fence does not include the fence along the top of the retaining wall.

ITEM 16A – 4’X6’ SINGLE SWING CHAIN LINK GATE

Work associated with 4’ single swing green vinyl coated chain link gate shall be paid for at the unit price per each as listed in the Bid Schedule. The unit price per each shall include all costs for materials, equipment and labor for supplying and installing 4’ single swing 6’ tall chain link gate as described in these specifications and/or shown on the Drawings.

ITEM 16B – 12'X6' DOUBLE SWING CHAIN LINK GATE

Work associated with 12' double swing green vinyl coated chain link gate shall be paid for at the unit price per each as listed in the Bid Schedule. The unit price per each shall include all costs for materials, equipment and labor for supplying and installing 12' double swing 6' tall chain link gate as described in these specifications and/or shown on the Drawings.

ITEM 16C – 20'X6' DOUBLE SWING CHAIN LINK GATE

Work associated with 20' double swing green vinyl coated chain link gate shall be paid for at the unit price per each as listed in the Bid Schedule. The unit price per each shall include all costs for materials, equipment and labor for supplying and installing 20' double swing 6' tall chain link gate as described in these specifications and/or shown on the Drawings.

ITEM 16D – 24'X6' DOUBLE SWING CHAIN LINK GATE

Work associated with 24' double swing green vinyl coated chain link gate shall be paid for at the unit price per each as listed in the Bid Schedule. The unit price per each shall include all costs for materials, equipment and labor for supplying and installing 24' double swing 6' tall chain link gate as described in these specifications and/or shown on the Drawings.

ITEM 17 – 4' OUTER FENCE

Work associated with outer fence shall be paid for at the unit price per linear foot as listed in the Bid Schedule. The outer fence shall consist of 4' green vinyl coated chain-link fence. The unit price per foot shall include all costs for materials, equipment and labor for supplying and installing outer fence as described in these specifications and/or shown on the Drawings. Outer fence does not include the fence at the stream crossing.

ITEM 17A – 4'X4' SINGLE SWING CHAIN LINK GATE

Work associated with 4' single swing green vinyl coated chain link gate shall be paid for at the unit price per each as listed in the Bid Schedule. The unit price per each shall include all costs for materials, equipment and labor for supplying and installing 4' single swing 4' tall chain link gate as described in these specifications and/or shown on the Drawings.

ITEM 17B – 12'X4' DOUBLE SWING CHAIN LINK GATE

Work associated with 12' double swing green vinyl coated chain link gate shall be paid for at the unit price per each as listed in the Bid Schedule. The unit price per each shall include all costs for materials, equipment and labor

for supplying and installing 12' double swing 4' tall chain link gate as described in these specifications and/or shown on the Drawings.

ITEM 18 – CABC STONE

This item of work shall include the furnishing and placement of CABC stone at locations directed by the Engineer and as shown on the Drawings. The quantity of CABC stone will be paid for at the contract unit price per ton of CABC stone placed in accordance with the Contract Documents. The Contractor shall furnish copies of certified weight tickets for all material placed on the project. Such prices will be full compensation for furnishing, hauling, placing, shaping and compacting CABC stone. No additional payment shall be made for CABC stone that must be maintained or replaced due to sedimentation or erosion. This item does not include CABC stone associated with the stream crossing.

ITEM 19 – I19.0B INTERMEDIATE COURSE

This item of work shall include the furnishing and placement of I19.0B Intermediate Course at locations directed by the Engineer and as shown on the Drawings. The quantity of I19.0B Intermediate Course measured as provided in the paragraph above, will be paid for at the contract unit price per ton of I19.0B Intermediate Course placed in accordance with the Contract Documents. The Contractor shall furnish copies of certified weight tickets for all material placed on the project. Such prices will be full compensation for furnishing, hauling, placing, shaping, compacting, tack coat, and surface repairs if necessary. This item does not include I19.0B Intermediate Course associated with the stream crossing.

ITEM 20 – S9.5B SUPERPAVE SURFACE COURSE)

This item of work shall include the furnishing and placement of S9.5B Superpave Surface Course at locations directed by the Engineer and as shown on the Drawings. The quantity of S9.5B Superpave Surface Course measured as provided in the paragraph above, will be paid for at the contract unit price per ton of S9.5B Superpave Surface Course placed in accordance with the Contract Documents. The Contractor shall furnish copies of certified weight tickets for all material placed on the project. Such prices will be full compensation for furnishing, hauling, placing, shaping, compacting, tack coat, and surface repairs if necessary. This item does not include S9.5B Superpave Surface Course associated with the stream crossing.

ITEM 21 – RETAINING WALL

This line item of work includes engineering, furnishing, and installing

retaining walls at locations shown on drawings. Contractor shall provide retaining wall design by a professional engineer licensed in North Carolina and will install in accordance with design. This line item will include all items required for installation including but not limited to wall material, leveling pad, underdrain, weep holes, backfill, approximately 260 linear feet fall protection barrier minimum 4' tall, and compaction as required by design. Payment will be made on a lump sum basis. This item does not include guardrail.

ITEM 22 – GUARDRAIL

The quantity of guardrail (per NCDOT standard installation) to be paid for will be the actual quantity installed and will be paid for at the unit price per linear foot listed in the Bid Schedule. The unit price per linear foot will be full compensation for all work including, but not limited to, material, equipment and labor for a complete installation as described in these specifications and/or shown on the Drawings. End treatments and terminations shall be considered incidental to this pay item. Guardrail & associated end treatments at the stream crossing are not included in this item.

ITEM 23 – TERRACE/DITCH TOE DRAIN

Work included in this line item of payment shall include all work associated with terrace/ditch toe drain as shown on the plans.

The quantity of terrace/ditch toe drain shall be paid for at the unit price bid per linear foot. The unit price will include all work terrace/berm toe drain including, but not limited to, material, installation, delivery, 4" perforated and 4" solid HDPE SDR 21 pipe, and tie straps. Fittings and bends are considered incidental to this item.

ITEM 24 – EARTHWORK

Work included in this line item of payment shall consist of all earthwork associated with the project, including excavation, placement and compaction of structural fill and subgrade, access road construction, stockpile areas, fine grading, and drainage features/permanent ditches to proposed contours. The earthwork associated with the stream crossing is included in item - stream crossing, and is not included in this item. The earthwork associated with permanent stormwater/sediment control pond, and temporary skimmer basin is not included in this item.

The lump sum price will be full compensation for all labor, equipment, and materials necessary for work associated with earthwork, including but not limited to excavation, backfill, compaction, and conditioning of fill soil for

proper moisture content (addition of water/drying soil on site), grading of all ditches shown by contours or line type on the Drawings, excavation, hauling, and placement of excess cut to stockpile areas, and fine grading/subgrade prep. Soils onsite to be used for fill with moisture content above optimum will not be considered unsuitable. Additional payment for drying or selecting soil from a different location on-site for the purpose of expediting the work will not be made by the Owner. The lump sum price shall also include re-spreading of topsoil removed during grubbing operations on permanent slopes or in non-structural areas.

The earthwork pay item will include all grading outside the liner limits and all grading inside the waste limits up to the subgrade (40 mil LLDPE) elevation. The lump sum price include a survey performed by a licensed NCPLS of the top of select backfill layer prior to placing the 40-mil LLDPE liner.

Protection of existing groundwater wells, gas monitoring wells, LFG extraction wells, and leachate extraction wells shall be incidental to the Earthwork lump sum bid price.

ITEM 25 – SOIL SCREENING

Work included in this item shall be providing mechanical screening to remove deleterious material, and rocks from stockpiled Landfill Base material or from soil excavated by the contractor to meet Landfill Base Material size requirements.

The quantity of Soil Screening will be paid for at the contract unit price per cubic yard in accordance with the contract documents for the actual amount of material screened. The quantity of material to be paid will be measured by pre and post survey of isolated cut area or stockpile area of screened soils.

ITEM 26 – ROCK EXCAVATION

Work associated with this bid item shall include removal of subsurface rock necessary to achieve proposed grades as encountered in the field and verified by the Engineer to be in compliance with specification 312020 Rock Excavation. The quantity of rock removed shall be paid for per cubic yard measured in place by the average end area method, based upon measurements made prior to and following excavation. The quantity measured will be paid for at the Contract unit bid price per cubic yard for rock excavation. Such price and payment will be compensation for all work necessary for rock removal and disposal on-site, including excavation, hauling, all blasting means and accessories or use of a rock hammer as approved by the Engineer.

ITEM 27 – REMOVE AND REPLACE UNSUITABLE MATERIAL

Work associated with this line item shall consist of removal of unsuitable material, and providing and placement of backfill material to replace unsuitable material removed. Unsuitable material must be verified and quantified by the Engineer prior to removal. Backfill material shall be from an onsite source.

The quantity of remove and replace unsuitable material to be paid for will be by cubic yard measurement in place by the average end area method, based on measurements made prior to and following placement. The unit price bid per cubic yard of remove and replace unsuitable material shall include all costs for excavation of unsuitable material, excavation of backfill, hauling, placement, and compaction.

ITEM 28– 30-INCH VEGETATIVE SUPPORT LAYER

Work included in this line item of payment shall include 30-inch Vegetative Layer as shown in the details.

The quantity of 30-inch vegetative layer will be paid for at the contract unit price per square foot in accordance with the contract documents. The certified liner edge as shown in the details will be the perimeter boundary for measuring vegetative layer quantities. The unit price bid for vegetative layer will be full compensation for all materials and labor including, but not limited to, equipment, verification surveys for depth provided by a licensed NCPLS, material (on-site or off-site), the addition of bentonite (If required), and compaction. The verification survey shall be performed after the vegetative support layer is installed so that the depth of the layer can be verified across the entire boundary. Payment will not be made until soil has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. Maintenance and repairs of the vegetative layer during construction shall be the responsibility of the Contractor, and no additional payment shall be made for damages and subsequent re-work due to weather. Additional depth at terrace and utility benches is incidental to this item.

ITEM 29 – 40 MIL LLDPE TEXTURED LINER

Work included in this line item of payment shall include all 40-mil textured liner within the limits of the certified liner edge as shown in the plans and details.

The quantity of 40-mil LLDPE textured liner will be paid for at the contract unit price per square foot of material placed and seamed together. The unit price of LLDPE textured liner will include all costs associated with the

purchase, delivery, and placement of the liner including, but not limited to, material, labor, seaming, ballasts, etc. The actual measured square footage will be based on field measurements of completed liner placement. Payment will not be made for this item until the geomembrane has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. The certified liner edge will be the perimeter boundary for measuring geomembrane quantities. All geomembrane material used for constructing the liner edges (including anchors) will be paid for under the permanent liner edge bid item as shown in details. Internal anchor trenches installed for construction purposes are considered incidental to this item.

ITEM 30 – 8-OUNCE DOUBLE SIDED GEOCOMPOSITE

Work included in this line item of payment shall include all 8-ounce double-sided geocomposite within the limits of the certified liner edge as shown in the plans and details. This line item includes both 8 ounce double sided geocomposite installed under and over the 40 mil LLDPE textured liner as shown on the drawings.

The quantity of 8-ounce double-sided geocomposite will be paid for at the contract unit price per square foot for material placed and seamed together. The unit price for 8-ounce double-sided geocomposite will include all costs associated with the purchase, delivery and placement of the material including, but not limited to, material, labor, seaming, sand bags, etc. The actual measured square footage will be based on field measurements of completed geotextile placement. Payment will not be made for this item until the 8-ounce double-sided geocomposite has passed testing requirements specified in these specifications and the Site Specific Construction Quality Assurance Plan. The certified liner edge will be the perimeter boundary for measuring 8-ounce double-sided geocomposite quantities. All 8-ounce double-sided geocomposite material used for constructing the liner edges will be paid for under the permanent liner edge bid item.

ITEM 31– PERMANENT LINER EDGE

Work included in this line item of payment shall include all four types of liner edge as shown in the details.

The quantity of permanent liner edge will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will be the full compensation for all work associated with the liner edge construction per the details, including but not limited to the, select backfill, 4” perforated HDPE SDR 21, 4” solid HDPE SDR 21 daylight pipes, fittings, welding, #5 or #57 washed stone, and filter fabric. 6-ounce double-sided

geocomposite and 40-mil LLDPE textured liner that is outside of the certified liner edge and is used in the liner edge construction is included in this item. Liner edge markers are included under a separate item. The construction of temporary drainage swales near liner edges to ensure stormwater runoff does not enter beneath the liner during construction is considered incidental to this item.

ITEM 32 – LINER EDGE MARKER

Liner edge markers will be paid for by the actual number installed at the unit price for each. The unit cost will include all materials, equipment, and labor for the complete installation as shown on the Drawings.

ITEM 33– GROUNDWATER MW15 WELL PROTECTION

Work included in this line item of payment shall include the protection of groundwater MW15 as shown on the plans and details.

The quantity of groundwater MW15 well protection will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will be the full compensation for all work associated with the groundwater MW15 well protection per the details, including but not limited to the, bollards, curbs, and other materials shown on the plans.

ITEM 34 – BI-AXIAL GEOGRID

This item of work shall include furnishing and installing geo-grid at locations shown on the plans, details, and as directed by the Engineer. Geogrid shall be Tensar BX1200 or an approved equivalent. Measurement will be made along the surface of the ground, over which the grid has been acceptably placed, and payment will be based on the actual surface area in square yards installed and accepted.

The unit bid price will be full compensation for all labor, equipment, and materials necessary to install the geogrid. Any necessary removal and replacement of material associated with the placement of the geogrid will be covered under the undercut unsuitable material, select backfill, and CABC Stone unit prices.

ITEM 35 – RAISING WELLHEAD: LFG ONLY

Work included in this line item of payment shall consist of Raising Wellhead: LFG Only. The quantity of Raising Wellhead: LFG Only will be paid for at the contract price for each wellhead installed and accepted per the plans and details. The contract unit price shall be full compensation for all labor, equipment, and materials necessary for work associated with Wellhead

Construction: LFG Only, including but not limited to raising the wellhead as necessary to accommodate the proposed grades, installation of any HDPE spool pieces, reducers, and/or fittings that may be required to reach the final elevation or provide connection to discharge piping, installation of wellhead cap, pipe boot and bentonite plug at the LLDPE liner, 2" ball type isolation valve, flexible hosing and 2" down-well piping. The existing Fine Tune Control Valve may be reused and re-installed when the wellhead is constructed. The existing stainless-steel clamps for the hosing may be reused.

ITEM 36 – RAISING WELLHEAD: LFG & LEACHATE

Work included in this line item of payment shall consist of Raising Wellhead: LFG & Leachate. The quantity of Raising Wellhead: LFG & Leachate will be paid for at the contract price for each wellhead installed and accepted per the plans and details. The contract unit price shall be full compensation for all labor, equipment, and materials necessary for work associated with Wellhead Construction: LFG & Leachate, including but not limited to raising the wellhead as necessary to accommodate the proposed grades, installation of any HDPE spool pieces, reducers, and/or fittings that may be required to reach the final elevation or provide connection to discharge piping, installation of wellhead cap, pipe boot and bentonite plug at the LLDPE liner, 2" ball type isolation valve, flexible hosing, 2" down-well piping, providing and installing the motor control panel and bracing, solar collector and bracing, down well operator drive, and leachate extraction piston pump as shown in the details. The existing Fine Tune Control Valve for each well and three (3) existing piston pumps may be reused and re-installed when the wellhead is constructed. The existing stainless-steel clamps for the hosing may be reused.

ITEM 37A – 4" HDPE LEACHATE COLLECTION/LANDFILL GAS PIPING

Work included in this line item of payment shall include all work associated with 4 -inch HDPE Leachate Collection/Landfill Gas pipe used as leachate collection system or landfill gas conveyance pipe as shown on the plans.

The quantity of 4 -inch HDPE Leachate Collection/Landfill Gas pipe shall be paid for at the unit price bid per linear foot. The unit price will include all work associated with 4 -inch HDPE Leachate Collection/Landfill Gas pipe including, but not limited to, material, installation and delivery. This item shall include the cost of welded caps where required. Leachate Cleanouts, connection to existing LFG flare station, and butterfly valves will be paid for under a separate item. Testing is incidental to this item.

ITEM 37B – 6” HDPE LEACHATE COLLECTION/LANDFILL GAS PIPING

Work included in this line item of payment shall include all work associated with 6 -inch HDPE Leachate Collection/Landfill Gas pipe used as leachate collection system or landfill gas conveyance pipe as shown on the plans.

The quantity of 6 -inch HDPE Leachate Collection/Landfill Gas pipe shall be paid for at the unit price bid per linear foot. The unit price will include all work associated with 6 -inch HDPE Leachate Collection/Landfill Gas pipe including, but not limited to, material, installation and delivery. This item shall include the cost of welded caps where required. Leachate Cleanouts, connection to existing LFG flare station, and butterfly valves will be paid for under a separate item. Testing is incidental to this item.

ITEM 37C – 8” HDPE LEACHATE COLLECTION/LANDFILL GAS PIPING

Work included in this line item of payment shall include all work associated with 8 -inch HDPE Leachate Collection/Landfill Gas pipe used as leachate collection system or landfill gas conveyance pipe as shown on the plans.

The quantity of 8 -inch HDPE Leachate Collection/Landfill Gas pipe shall be paid for at the unit price bid per linear foot. The unit price will include all work associated with 8 -inch HDPE Leachate Collection/Landfill Gas pipe including, but not limited to, material, installation, delivery, and connection to existing piping at pump station or near LFG knockout. This item shall include the cost of welded caps where required. Leachate Cleanouts, connection to existing LFG flare station, and butterfly valves will be paid for under a separate item. Testing is incidental to this item.

ITEM 38 – 6” BUTTERFLY VALVE

Work included in this line item of payment shall include all work associated with 6” Butterfly Valve as shown on the plans.

The quantity of 6” Butterfly Valve shall be paid for at the unit price bid per each. The unit price will include all work associated with 6” butterfly valve including, but not limited to, material, installation, monitoring ports, couplers and fittings, reducers, delivery, valve box, fittings and stone.

ITEM 39 – CLEANOUTS – HDPE LEACHATE COLLECTION PIPING

This item of work shall include furnishing and installing leachate cleanouts at locations shown on the plans. The unit cost will include the material and installation. This item shall include prefabricated long slope elbow transition at slope/floor transition.

Payment for this item shall be the actual number of leachate cleanouts installed and accepted by the Engineer.

ITEM 40 – LFG FLARE STATION RESTART

This item includes all work associated with re-starting the flare station after the new LFG HDPE collector piping and wellheads have been installed and tested. This item will allow the Contractor to trouble-shoot the well field to ensure that oxygen is not being introduced into the flare. This item does not include the repair or replacement of any parts at the flare station, but is primarily used to verify that the new LFG collection piping and wellheads are in working order.

ITEM 41 – 1,000 GALLON SEPTIC TANK W/ EFFLUENT FILTER

Work included in this line item of payment shall include all work associated with 1,000 Gallon Septic Tank w/ effluent filter.

The quantity of this item will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will include all materials, labor , testing, and equipment required for the installation of the 1,000 Gallon Septic Tank w/ effluent filter and connection to existing influent line near the existing septic tank. Connection between the septic tank and pump station is included in the duplex package pump station line item.

ITEM 42 – DUPLEX PACKAGE PUMP STATION

Work included in this line item of payment shall include all work associated with Duplex Package Pump Station.

The quantity of this item will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will include all materials, labor, testing, and equipment required for the installation of the Duplex Package Pump Station and connection to proposed 1,000 gallon septic tank with effluent filter and electrical connection to existing service from bus garage.

Force main piping from the duplex package pump station to the existing pump station near the LFG flares included under separate items.

ITEM 43 – SEPTIC TANK ABANDONMENT

Work included in this line item of payment shall include all work associated with abandonment of the existing septic tank in place. The septic tank abandonment shall be performed by the direction of the Haywood County Health Department.

The quantity of this item will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will include all materials, labor and equipment required for the abandonment of the septic tank and pumping out the tank.

ITEM 44 – 2" HDPE FORCE MAIN

Measurement of force main shall be the actual number of linear feet of pipe installed, complete in place and accepted, measured from the new duplex package pump station to the air release valve.

2" HDPE Force Main shall be paid for at the unit price bid per linear foot. The unit price bid for pipe shall include all equipment, labor, and material costs for complete construction, including but limited to excavation and temporary trench support if necessary, dewatering, fusion welding, adjustment of vertical alignment to achieve 1' minimum clearance from storm drainage piping, fittings and concrete thrust blocks, connection, backfill and compaction, and testing.

ITEM 45 – 3" HDPE FORCE MAIN

Measurement of force main shall be the actual number of linear feet of pipe installed, complete in place and accepted, measured from the air release valve to the existing pump station near the LFG flare.

3" HDPE shall be paid for at the unit price bid per linear foot. The unit price bid for pipe shall include all equipment, labor, and material costs for complete construction, including but limited to excavation and temporary trench support if necessary, dewatering, fusion welding, adjustment of vertical alignment to achieve 1' minimum clearance from storm drainage piping, fittings and concrete thrust blocks, connection, backfill and compaction, connecting to proposed 8" HDPE leachate piping, and testing.

ITEM 46 – AIR RELEASE VALVE

Air release valves will be paid for by the actual number installed at the unit price for each. The unit cost will be full compensation for all materials, equipment, and labor for the complete installation as shown on the Drawings, including but not limited to excavation, HDPE manhole, sewage combination air release valve with appurtenances, flanged watertight cover, and backfill and compaction.

ITEM 47A – ITEM 47E – HDPE STORMWATER PIPE

Measurement of HDPE storm drainage pipe shall be the actual number of linear feet of pipe installed, complete in place and accepted, measured from the starting point to the finish point of each section of line.

Storm drainage pipe shall be paid for at the unit price bid per linear foot for every pipe size shown on the plans. The unit price bid for pipe shall include all excavation and temporary trench support if necessary, dewatering, pipe installation including tie-in to proposed structures, connection to storm drainage structures, backfill including washed stone around the pipe per detail, concrete slope anchors, backfill and compaction above pipe, testing, removal and disposal of accumulated sediment during construction.

ITEM 48 – STORMWATER CONCRETE HEADWALL

This item of work shall include furnishing and installing pre-cast concrete headwalls at the locations shown on the plans and per the standard headwall detail shown on the Contract Documents. The unit bid price each shall include excavation and subgrade prep, installation of headwall, grouting of pipe opening, backfill, and any fine grading necessary to provide proper drainage for all standard concrete headwalls.

ITEM 49 – FLARED END SECTION

This item of work shall include furnishing and installing flared end sections at the locations shown on the plans and per the flared end section detail shown on the Contract Documents. The unit bid price each shall include excavation and subgrade prep, installation of flared end section, grouting of pipe opening, backfill, and any fine grading necessary to provide proper drainage for all standard flared end sections.

ITEM 50 – STORMWATER JUNCTION BOX

This item of work shall include furnishing and installing Stormwater Junction Boxes at locations shown on the plans. The unit bid price per each shall include excavation, installing pre-cast concrete catch basin with steps, installation of manhole frames and lids as shown on the Contract Documents, and backfill and compaction. Storm drainage pipes shall be cut flush with the inside face of the catch basin walls with the gap between pipe and catch basin wall to be grouted smooth. Inverts shall be poured with concrete to provide smooth flow from pipe to pipe and to prevent standing water.

ITEM 51 - STORMWATER CATCH BASIN

This item of work shall include furnishing and installing Stormwater Catch Basins at locations shown on the Contract Documents. The unit bid price each shall include excavation, installing pre-cast concrete catch basin with steps, installation of frames, grates, and hoods as shown on the Contract Documents, and backfill and compaction. Storm drainage pipes shall be cut flush with the inside face of the catch basin walls with the gap between pipe and catch basin wall to be grouted smooth. The quantity of stormwater catch basin will be paid for each stormwater catch basin installed as shown on the drawings.

ITEM 52 – STORMWATER OPEN THROAT INLET

This item of work shall include furnishing and installing Stormwater Open Throat Inlets at locations shown on the Contract Documents. The unit bid price each shall include excavation, installing pre-cast concrete catch basin with steps, installation of frames, grates, and hoods as shown on the Contract Documents, and backfill and compaction. Storm drainage pipes shall be cut flush with the inside face of the catch basin walls with the gap between pipe and catch basin wall to be grouted smooth. The quantity of stormwater open throat Inlet will be paid for each stormwater open throat installed as shown on the drawings.

ITEM 53 – CONNECTION TO EXISTING CATCH BASIN

This item of work shall include connecting proposed pipe to an existing catch basin at the northeast corner of the bus garage. Measurement of connection to existing inlet shall be the actual number of connections made and accepted. The unit bid price each shall include excavation, equipment, labor, cutting the existing inlet to accept the proposed pipe, installing proposed pipe through the existing inlet and cutting flush with the inside wall, grouting area closed around the pipe,
backfill and compaction, and abandoning existing outlet pipe in place by grouting pipe closed.

ITEM 54 – ASPHALT CURB

This item of work shall include furnishing and installing Asphalt Curb at locations shown on the Contract Documents. The unit bid price per linear foot shall include all equipment, labor, material supply, delivery, installation, and compaction as shown Contract Documents. The quantity of asphalt curb will be measured along the ground per linear foot installed per the drawings and Contract Documents.

ITEM 55 – 2" PVC CONDUIT DUCT BANK

Measurement of 2" PVC Conduit Duct Bank shall be the actual number of linear feet of duct bank installed in place and accepted, measured from the starting point to the finish point of the duct bank. The duct bank will consist of a total of 3 individual conduits with integral pull boxes. Pull boxes material & labor is considered incidental to the price for duct bank. 2" PVC Conduit should not be installed without prior authorization from the Engineer.

2" PVC Conduit Duct Bank will be paid for at the unit price bid per linear foot. The unit price bid for pipe shall include all excavation and temporary trench support if necessary, dewatering, conduit installation, pull boxes, backfill and compaction, and testing.

SECTION B – ADDITIONAL WORK IF ORDERED BY ENGINEER

ITEM 56 – EROSION CONTROL CASH ALLOWANCE

An erosion control cash allowance of $50,000.00 has been included in the Bid Schedule to cover the cost of adding erosion control measures, unforeseen at this time and beyond those already shown on the plans. This could include temporary sediment traps, stormwater culverts, riprap for ditches and pipe outlets, and erosion control matting. The contractor will not be eligible for compensation of this allowance unless a proposal of cost for completing the work is submitted to the Engineer prior to beginning construction. The Contractor will be required to provide documentation for all expenses incurred. Maintenance of existing erosion control measures, or additional measures required for phasing of the work or preparation of storm events shall not be eligible for compensation under the cash allowance. This item will only be paid at the sole discretion and prior approval of Engineer and Owner.

SECTION C – ADD ALTERNATES

ITEM 57 – STREAM CROSSING

Work included in this line item of payment shall consist of the installation of the proposed Stream Crossing shown on C-109 & C-509.

The quantity of stream crossing will be paid for at the contract lump sum price in accordance with the Contract Documents. The lump sum price will be full compensation for all labor, equipment, and materials necessary for work associated with the stream crossing, included but not limited to design of arch culvert (stamped by a North Carolina Professional Engineer including arch culvert, foundation, wing walls, etc. for a complete installation) and bedding to proposed geometry, furnishing and installation

of single radius arch Contech ALSP or approved equal, installation of arch foundation, supply and installation of aluminum end walls, dewatering, temporary dams, pump around during construction, toe stabilization installation, drainage material and fabric behind toe stabilization, backfill, compaction, earthwork, guardrail, guardrail end treatments, skimmer basin 3, silt fence and super silt fence, riprap, grassing and matting, asphalt paving, CABC stone paving, traffic control, 30ft double swing chain link gate, and chain link fencing.

SECTION 024116 DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of structures and/or site improvements.
2. Abandoning in place or removing below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.

1.3 DEFINITIONS

A. Demolish: Completely remove and legally dispose of as shown on drawings or off-site.

B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

C. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

D. Salvage: Carefully detach from existing construction, in a manner to prevent damage, allow for further use, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes the property of Contractor.

B. Timber, steel and other merchantable goods and materials removed incidental to demolition shall remain the property of the Owner unless otherwise directed.

SECTION 223121 PACKAGE EFFLUENT PUMP STATION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. The contractor shall furnish and install one (1) sewage effluent pump station. Pump(s) shall be of the submersible centrifugal type with recessed pumping impeller, fiberglass wetwell basin, and submersible motor. Pump(s) shall be installed on lift-out rail system(s) in order to allow for easy removal without requiring entry into the wetwell. Contractor shall include all labor, materials, equipment, incidentals and ancillary components to make a complete system.

B. Unless otherwise noted, all materials and equipment supplied under this Section shall be new, of good quality, and in good condition.

1.02 SYSTEM DESCRIPTION

A. Pump(s) shall be installed in such a way that effluent is fed in an upflow direction to the impeller **with no feet, rails or other obstructions below grinder inlet.** Pump shall not be intended to handle abrasive materials or sewage containing large excessive amounts of sand, grit, or other stone like compositions. Pumps shall have a capacity of 40 GPM against a total dynamic head of 75 feet and be capable of pumping ¾" solids. Pump shall have a 2" vertical NPT discharge.

1.03 QUALITY ASSURANCE

A. Manufacturer: The pump station shall be supplied by a reputable manufacturer with at least five (5) years experience in the manufacture of submersible pumps.

B. Factory Tests: The pumps shall be tested at the factory under simulated field conditions for excessive vibration, leaks, and operation of all automatic systems. The controls shall be adjusted to start and stop the pumps to satisfy field conditions. For each unit, a pump performance curve shall be produced from the factory testing. Its veracity shall be certified and the curves shall be identifiable by serial numbers of pumps and motors. Manufacturer shall submit size copies of the certified curves to the Engineer. Engineer will judge adequacy of performance and distribute copies of curves appropriately.

1.04 SUBMITTALS

A. Shop Drawings: The Contractor shall submit five (5) sets of shop drawings and/or wiring diagrams for the major equipment to be installed such as the pump and motor starters and controls.

B. Operation and Maintenance Manuals: Three (3) copies of a standard operation and maintenance manual for the pump units shall be supplied by the Contractor.

1.05 DELIVERY, STORAGE AND HANDLING

A. All equipment shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations.

1.06 WARRANTY

A. The Contractor shall include in the bid price for this item a guarantee to the Owner, from the manufacturer(s), for one (1) year from the date of final acceptance by the Owner, that the pumps, including ancillary equipment, apparatus and parts, shall be free from defective materials, equipment or workmanship, including with respect to equipment, the services of qualified factory trained servicemen, as may be required. Under the guarantee, the manufacturer shall furnish replacements for any component which proves defective, except those items that are normally consumed in service, such as light bulbs, oil, grease, packing, gaskets, "0"-rings, etc. The pump manufacturer shall be solely responsible for the warranty of the station and all components. Components failing to perform as specified by the Engineer, or as represented by the manufacturer, or proved defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the Owner.

B. The manufacturer shall assume liability for consequential damages or contingent liabilities arising out of the failure of any product of parts thereof to operate properly, however caused by or resulting from or arising out of defects in design or manufacture, delays in delivery, replacement, or otherwise.

C. The warranty shall become effective upon the acceptance of the installation by the Owner.

1.07 PUMP PREQUALIFICATION SPECIFICATION

A. Manufacturers wishing to supply equipment for this project must submit a prequalification submittal for approval to the Engineer. The prequalification

submittal must be received by the Engineer at least fourteen (14) days prior to the bid opening date to receive consideration. The submittal shall demonstrate that the proposed equipment meets the requirements of the Contract Specifications and Drawings. The Engineer will issue an addendum prior to the bid date listing the approved manufacturers. The prequalification submittal shall include, as a minimum, the following information:

1. Literature and cut sheets from manufacturer(s) describing equipment
2. Pump operating curves
3. Proposed motor sizes and speeds
4. Copy of warranties
5. List of at least five (5) references for similar installations, including contact names and current telephone numbers
6. A written statement from the manufacturer indicating that the manufacturer has reviewed the proposed application as detailed in the Contract Drawings and Specifications, and that all equipment, materials and systems proposed to be supplied are appropriate and compatible for this specific application.

B. **Note:** The submittal of prequalification information does not omit the requirement for the Contractor and manufacturers to submit complete shop drawing submittals to the Engineer in accordance with the Contract Documents.

1.08 MANUFACTURER AND SUPPLIER INFORMATION

A. Manufacturer Nameplate: A manufacturer's nameplate shall be securely and permanently mounted to each individual piece of equipment furnished under this Section. The nameplate shall be constructed of a durable, non-corrosive material. Critical information shall be clearly engraved or otherwise permanently stamped on the nameplate, and shall be fully legible. The information contained on the manufacturer nameplate shall include at least the following:

1. Manufacturer's Serial Number
2. Name, address and telephone number of equipment manufacturer
3. Model and/or Part Number, including pump impeller sizes, when applicable
4. Performance Criteria (i.e., capacity, design point, etc.)
5. Motor size, speed and voltage
6. Enclosure Type or Rating

7. Any other pertinent information

Note: All equipment shall include a nameplate with a manufacturer serial number validating the equipment as new. Failure to meet these requirements will be cause for rejection of the equipment.

B. Supplier and Service Information: A durable nameplate, stamp or sticker shall be adhered to each individual piece of equipment containing the name, address, and telephone number of the local business that supplied the equipment, and the name, address and telephone number of the local business that can provide service and replacement parts for the equipment. A 24-hour emergency service telephone number should also be included.

PART 2: PRODUCTS

2.01 MATERIALS

A. Basin: The basin shall be 48" I.D. and be constructed of fiberglass reinforced polyester with resin gelcoated surfaces. Minimum wall thickness shall be 3/8". Contractor shall provide sufficient concrete, as per manufacturers' specification to prevent floatation.

2.02 EQUIPMENT

A. Pump: Pump impeller shall be of the semi-open non-clog type to provide an open unobstructed passage through the volute. Impeller shall be of cast iron and shall thread onto stainless steel shaft.

B. Seal Chamber: Motor shall be protected by single mechanical silicon carbide, Buna-N elastomers.

C. Pump and Motor Casting: All castings shall be of high tensile strength cast iron. Castings shall be treated with phosphate and chromic rinse prior to painting. Castings shall be painted with a high quality lead free, alkyd enamel finish.

D. Fasteners: All fasteners shall be of 300 series stainless steel.

E. Motors:

1. Pump motor shall be of the totally enclosed, submersible, squirrel cage, induction type rated 1 ½ hp, single phase, 208 volts and shall be NEMA B type.

2. Pump motor shall be fully submerged in turbine oil for lubrication

and heat transfer, have capacitor start motors, built-in overload with automatic reset and SJTOW or STOW severe duty oil and water resistant power cords.

F. Power and Cords: Motor power cord shall be 16/3 or 14/3 SOW/SOWA 4 conductor of proper length to suite installation. Motor control cords to be `8/5 SOW/SOWA 5 conductor of proper length to suit installation. Each cable shall be provided with a green ground wire to be grounded in accordance with local and national electric codes.

G. Cable Entry System: Cable entry system shall consist of three separate seals. A rubber grommet that seals both cable jackets shall be clamped onto cord by end holding cap. An "O" ring shall seal end holding cap to bottom half of cord cap. Both cables shall have individual conductors stripped and potted into motor end cap with epoxy potting compound. Potting compound shall prevent wicking of water into motor if the cable jacket becomes damaged. Cords shall withstand a pull of 150 pounds without loosening or losing integrity. The end holding cap shall have female threaded tapping for 1" conduit.

H. Lift-Out Rail System:

1. Rail systems shall consist of a combined check valve and seal fitting that mounts vertically into a stationary discharge casting. A simple downward motion shall connect pump and combination check valve and seal fitting to the stationary discharge casting. Check valve and seal fitting shall seal with two "O" rings and a tapered rubber seal ring into funnel of discharge case. Check valve flapper shall be spring loaded to prevent water hammer slam. Discharge casting shall be furnished with right or left hand discharge pipe connections for duplex systems. Discharge pipe tapping shall be 3" NET female for standard pipe.

2. Valve casting and discharge casting shall be painted with a high quality, lead free, alkyd enamel finish.

3. An upper guide plate shall be attached to pump to support lift-out fitting and guide pump on rails. A lifting eye shall be attached to plate and a 5/15 SST chain, and clevice shall be furnished for lifting pump.

4. Two hold down brackets shall be provided to prevent pump and seal from rising on rails.

5. Guide rails shall be 1 1/4" SST pipe. Hold down pipe shall be 1/2" SST pipe.

6. Rail support and mounting bushing shall be mounted to basin wall and shall not be attached to the basin cover or cover frame.

7. Guide rail support shall be adjustable so that perfect vertical alignment of the rails can be obtained.

8. Pump hatch shall have a minimum 26" x 36" rectangular opening. Hatch cover shall be of the diamond pattern, no-skid type and shall be provided with lock hasp and held open arm. Hatch shall be made of aluminum or steel. Steel hatch covers shall be painted with a high quality, lead free, enamel paint. Aluminum hatch cover to be cast in place into concrete cover or steel hatch to be sealed into round steel basin cover.

I. Pump Control Panel:

1. The Contractor shall provide and install a complete pump control system specially designed for use with the pumping units supplied. The system shall be fully automatic and shall consist of a pump control relay which operates by float switches installed in the wet well to start and stop pumps at the levels indicated on the drawings.

2. The control system for both pumps shall be enclosed in a NEMA 4X enclosure and shall include a Hand-Off-Auto selector switch, green "pump" run light, and a red "pump off" light, and a digital run time meter for each pump. The control panel shall include alternators to alternate Pumps #1 and #2, audible and visual alarms, and an automatic dialer to notify maintenance personnel in the event of highwater, pump failure, or power failure, all necessary circuit breakers and fusible disconnects, phase failure protection, lighting arrestors, enclosed heater, and motor starters.

J. Pumps shall be Goulds Model WE1518H 3885 WE or approved equal.

PART 3: EXECUTION

3.01 INSTALLATION

A. The package effluent pump station shall be installed in strict accordance with the manufacturer's recommendations.

3.02 QUALITY CONTROL AND FIELD TESTING

A. Quality Control: The package grinder pump station supplier shall furnish the services of a technical representative to inspect the installation of the pump stations and to provide start-up and operator training services.

B. Field Testing:

1. After the pump/motor assembly, control system, piping, etc. have been satisfactorily completed and approved by the Engineer, the pumps shall be tested in accordance with the manufacturer's recommendations. The minimum test procedure shall include a hydrostatic pressure test at 150 pounds per square inch for a period of two (2) hours before pump operation. Any leaks or defects found in the pump/motor assembly suction and/or discharge piping will be repaired and made tight to the satisfaction of the Engineer.

2. Pump start-up and testing shall be done in the presence of the Engineer and shall demonstrate conformance to the conditions shown on the contract drawings.

3.03 SPARE PARTS

A. The Contractor shall furnish one (1) complete set of recommended spare parts for each size pump. All spare parts are to be conveyed to the Owner.

END OF SECTION

C. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 SUBMITTALS

A. Proposed Protection Measures: Submit, as requested, informational report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings and Property: Detail special measures proposed to protect adjacent buildings to remain and property.

B. Schedule of Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

C. Demolition Plans: Drawings indicating the following:

1. Locations of temporary protection.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Preconstruction Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before the Work begins.

F. Landfill Records: Provide receipt for the acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Pre Construction Meeting: Conduct meeting at Project site to review methods and procedures related to demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be demolished.
2. Review and finalize demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review and finalize protection requirements.
4. Review procedures for noise control and dust control.
5. Review procedures for protection of adjacent structures.
6. Review items to be salvaged and returned to Owner.
7. Review procedures for the disposal of hazardous waste.

1.7 PROJECT CONDITIONS

A. Structures to be demolished will be vacated and their use discontinued before start of the Work.

B. Structures immediately adjacent to the demolition area may be occupied or otherwise in operation. Conduct demolition so operations of occupied or operating structures will not be disrupted.

1. Provide not less than three (3) business days' notice of activities that will affect operations of adjacent occupied or operating structures.
2. Maintain access to existing roadways, walkways, exits, and other facilities used by occupants/operators of adjacent structures.

   a. Do not close or obstruct roadways, walkways, exits, or other facilities used by occupants/operators of adjacent structures without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by the Contractor by way of a Change Order or by the Owner under a separate contract. If the removal of hazardous materials results in a delay to the Contractor's schedule an appropriate adjustment will be made to the Contract Time by way of Change Order.

E. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or the operations of adjacent occupied or operating structures.

B. Vehicular access to the Administration, Maintenance, and Bus Garage Facility must be maintained throughout construction during business hours, Monday through Friday.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Division 31 Section "Earthwork"."

PART 3 - EXECUTION

3.1 EXAMINATION

A. As needed, verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction provided by Owner, if available. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Inventory and record the condition of items to be removed and salvaged. Provide photographs and/or video of conditions that might be misconstrued as damage caused by salvage operations.

D. As necessary, perform or engage a professional engineer properly licensed to practice in the state of the project site to perform an engineering survey of condition of structure to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during demolition operations.

3.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off all utilities serving structures to be demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied or operating structures, then provide temporary utilities that bypass structures to be demolished and that maintain continuity of service to other structures.
3. Cut off pipe or conduit a minimum of 36 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

B. Existing Utilities: Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent roadways, walkways, loading docks, structure entries, and other facilities during demolition operations. Maintain exits from existing structures.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

   a. Provide at least 3 business days' notice to occupants/operators of affected structures if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as roadways, walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.

1. Protect adjacent structures and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.

3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent structures and facilities to remain.
5. Provide protection to ensure safe passage of people around demolition area and to and from occupied or operating portions of adjacent structures.
6. Protect all adjacent improvements that are to remain and that are exposed to demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied or operating portions of adjacent structures.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated existing structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least two hours after flame cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate demolition equipment and remove debris and materials so as not to impose excessive loads on any part of the structure.

B. During demolition, perform surveys to detect hazards that may result from demolition activities.

C. Site Access and Temporary Controls: Conduct demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and operating facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or operating facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed areas if required by Owner or authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations. Do not use water when it may damage adjacent structures or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

D. Bituminous Paved Areas: Scarify and completely remove. Resultant material may be utilized in bottom portion of areas to receive fill. No pieces shall be left exposed in the fill slopes. If material is used in any portion of the new construction, layers shall be a maximum of 8 inches and separated by minimum 6-inch layers of earth. Water and compaction requirements are specified under other sections. No compaction is required for materials used for obliteration work outside the limits of new construction.

E. Removal of Concrete Surfaces and Structures: Concrete designated for removal, break into pieces and use for rip rap. Volume, minimum 0.5 cubic feet; 75 percent of pieces shall be between 1.5 and 2.0 cubic feet. Stockpile at designated locations.

F. Pipe Removal: Remove pipe, exercising care to avoid breaking or damaging. Store pipe to be re-layed as directed.

3.5 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural members systematically, from higher to lower level.

B. Remove debris from elevated portions of a structure by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be salvaged are indicated on Drawings.

D. Below-Grade Construction: Demolish all below-grade construction that is within the footprint of new construction and extending 5 feet outside footprint indicated for new construction. Abandon below-grade construction outside this area.

1. Remove below-grade construction to at least 36 inches below grade, unless otherwise indicated.

E. Existing Utilities: Abandon existing utilities and below-grade utility structures as shown on the Drawings.

1. Fill abandoned utility structures with satisfactory materials according to backfill requirements in Division 31 Section "Earth Moving."
2. Piping: Disconnect piping at unions, flanges, valves, or fittings.
3. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.6 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from demolition operations with satisfactory soil materials according to backfill requirements in Division 31 Section "Earthwork."

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades. Eliminate areas where water may collect in depressions.

3.7 REPAIRS

A. Promptly repair damage to adjacent improvements caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Demolished materials shall be disposed of as shown on the Drawings or in a permitted disposal facility.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.

END OF SECTION 024116

SECTION 311000 SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Protecting existing vegetation to remain.
   2. Removing trees and roots.
   3. Removing existing vegetation.
   4. Clearing and grubbing.
   5. Stripping and stockpiling topsoil.
   6. Removing above- and below-grade site improvements.
   7. Disconnecting, capping or sealing, and abandoning site utilities in place.
   8. Temporary erosion and sedimentation control measures.

B. Related Sections:

   1. Division 02 “Demolition”

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, as indicated on Drawings or as designated by the Engineer.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, as indicated on Drawings or as designated by the Engineer.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

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

B. Timber, steel and other merchantable materials removed incidental to clearing and grubbing shall remain the property of the Owner unless otherwise directed.

1.5 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

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

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Work on Adjoining Property: Work on adjoining property will be not permitted without the written consent of the property owner and the Engineer. This shall include, but not limited to temporary access to the Work, storage of materials and any ground disturbing activities.

C. Utility Locator Service: Notify appropriate utility locator services for area where Project is located a minimum of 72 hours prior to commencing site clearing activities.

D. Do not commence site clearing operations until temporary erosion and sedimentation control and plant/tree protection measures are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

H. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earthwork".

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain groundwater monitoring wells, landfill gas monitoring wells, gas extraction wells, benchmarks, and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.

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

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

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.

D. Upon the establishment of permanent vegetative covers, remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site (including root structure) to avoid injury.

B. Enclose the trunks of trees which are to remain adjacent to the work with substantial wooden boxes of such height as may be necessary to protect them from piled material, equipment or equipment operation. Use excavating machinery and cranes of suitable type and operate the equipment with care to prevent injury to remaining tree trunks, roots, branches and limbs.

C. Do not cut branches, limbs, and roots except by permission of the Engineer. Cut smoothly and neatly without splitting or crushing. In case of cutting or unavoidable injury to branches, limbs, and trunks of trees, neatly trim the cut or injured portions and cover with an application of grafting wax and tree healing paint as directed.

D. Protect by suitable means all cultivated hedges, shrubs and plants that might be injured by the Contractor's operations. Promptly heel in any such trees or shrubbery necessary to be removed and replanted. Perform heeling in and replanting under the direction of a licensed and experienced nurseryman. Replant in their original position all removed shrubbery and trees after construction operations have been substantially completed and care for until growth is reestablished.

E. Replace cultivated hedges, shrubs, and plants injured to such a degree as to affect their growth or diminish their beauty or usefulness, by items of kind and quality at least equal to the kind and quality existing at the start of the work.

3.4 EXISTING UTILITIES

A. Locate, identify, and disconnect utilities indicated to be removed or abandoned in place.

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

1. Notify Engineer not less than three (3) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

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

3.5 CLEARING AND GRUBBING

A. Clearing and grubbing shall consist of the removal and satisfactory disposal of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, posts, fences, stubs, rubbish and all other objectionable matter resting on or protruding through the original ground surface and occurring within the construction limits or right of way of any excavation, borrow area, or embankment.

B. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and stockpile in approved areas, if approved by Engineer, or dispose of off-site.

C. The work of clearing shall only be performed within the limits established by the plans, specifications, or the Engineer.

D. Clearing shall consist of the felling and cutting up, or the trimming of, trees and the satisfactory disposal of the trees and other vegetation together with the down timber, snags, brush and rubbish occurring within the areas to be cleared. Trees and other vegetation, except such individual trees, groups of trees, and vegetation, as may be indicated on the plans to be left standing, and all stumps, roots and brush in the areas to be cleared shall be cut off 6 inches above the original ground surface.

E. Individual trees and groups of trees designated to be left standing within cleared areas shall be trimmed of all branches to such heights and in such manner as may be necessary to prevent interference with construction operations. All limbs and branches required to be trimmed shall be neatly cut close to the whole of the tree or to main branches, and the cuts thus made shall be painted with an approved tree wound paint. Individual trees, groups of trees, and other vegetation, to be left standing shall be thoroughly protected from damage incident to construction operations by the erection of barriers or by such other means as the circumstances require.

F. The Engineer will designate all areas of growth or individual trees which are to be preserved due to their desirability for landscape or erosion control purposes. When the trees to be preserved are located within the construction limits, they will be shown on the plans or designated by the Engineer.

G. Clearing operations shall be conducted so as to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and so as to provide for the safety of employees and others. When such damages occur, all damaged areas shall be repaired, removed or otherwise resolved utilizing generally accepted practices at the Contractor's expense.

H. Grubbing shall consist of the removal and disposal of all stumps, roots and matted roots from all cleared areas, except as herein specified.

I. In embankment areas, when the depth of embankment exceeds 42 inches in height sound stumps shall be cut off not more than 6 inches above the existing ground level and not grubbed. Unsound or decayed stumps shall be removed to a depth of approximately 2 feet below the natural ground surface.

J. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

K. Clearing and grubbing operations shall be completed sufficiently in advance of grading operations as may be necessary to prevent any of the debris from the clearing and grubbing operations from interfering with the excavation or embankment operations. All work under this section shall be performed in a manner which will cause minimum soil erosion. The Contractor shall perform such erosion control work, temporary or permanent, as may be directed by the Engineer in order to satisfactorily minimize erosion resulting from clearing and grubbing operations.

3.6 TOPSOIL STRIPPING

A. Strip topsoil to a depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

   1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

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

   1. Limit height of topsoil stockpiles to 72 inches.
   2. Do not stockpile topsoil within protection zones.
   3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
   4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

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

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

   1. Unless existing, full-depth joints coincide with line of demolition, neatly saw-cut along the line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

C. If items are shown on the plans to be fully or partially removed and replaced, those existing improvements shall be carefully disassembled and/or removed as necessary to permit construction, safely stored by the Contractor to prevent harm to the materials, then following construction, reassembled in the original location in a manner that matches the assembly prior to its removal.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

B. All combustible matter shall be deposited at locations approved by authorities having jurisdiction. Combustible matter may be burned (with written approval of authorities having jurisdiction) or may be disposed of as stated above.

C. Debris shall not be burned unless written permission or permit is issued by the Fire Marshall or other entity having jurisdiction. The Contractor shall adhere to all limitations and conditions set forth in the permit.

D. Burning shall be done at such time and in such a manner as to prevent fire from spreading and to prevent any damage to adjacent cover and shall further be subject to all requirements of agencies having jurisdiction pertaining to the burning. Disposal by burning shall be kept under constant attendance until all fires have burned out or have been extinguished.

END OF SECTION 311000

SECTION 312000 EARTHWORK

PART 1: GENERAL

1.1 SCOPE OF WORK

A. General: The work included in this section consists of the grading of the project area. The work includes:

1. Proofrolling and grading of the property to the prescribed elevations.

2. Stockpiling or wasting on site of any excess cut material for providing acceptable material as required to obtain the desired grades.

3. Construction of earthen embankments.

4. Placement of Structural Fill Material in order to bring the site to base grade elevations.

5. Preparation of landfill base in areas of in situ material.

6. Maintaining existing erosion control structures impacted by Work within project limits.

7. Topographic surveys provided by Contractor.

   A. Top of Subgrade (LLDPE Liner Elevation) Layer Survey
   B. Top of Vegetative Layer Survey

B. Related Sections:

1. Division 31 Section “Excavation and Backfill”.

2. Site Specific Construction Quality Assurance Plan (in Appendix).

1.2 SITE CONDITIONS

A. Site Information: Test borings and other exploratory operations may be undertaken by the Contractor at his own expense, provided such operations are acceptable to the Owner.

PART 2: PRODUCTS

2.1 MATERIALS

A. Unstable Material:

1. The entire area within the limit of work shall be cleared and grubbed

and shall be cleaned of all debris. Under the structures, paved, and fill areas; stumps, roots, logs, matted roots and other debris not suitable for foundations purposed shall be removed to a minimum depth of eighteen (18) inches below any subgrade. The resulting excavation shall be backfilled with suitable material and compacted as specified hereinafter for Fill Material. Cleared materials shall be completely removed from within the limits of work and disposed of on site by the Contractor at a location approved by the Owner.

2. Organically contaminated soils must be removed from the area of grading operations. At the discretion of the Engineer, topsoil within the area to be stripped shall be stockpiled in a convenient area, selected by the Engineer, for later use in planting area. All topsoil shall be graded by the Engineer as suitable and shall be stockpiled separately as directed by the Engineer in the field.
3. All areas to receive fill shall be stripped of root mat five (5) feet beyond toe of anticipated fills. Topsoil, all vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish and other debris within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill placement begins. In no case will such objectionable material be allowed to remain in or under the fill area.
4. Soft or excessively yielding material shall be removed and replaced with inert controlled fill.

B. <u>Structural Fill Material:</u>

1. Material to be used for fill shall be approved by the Engineer.
2. All roots, organic matter, trash, debris, and other unsuitable materials that may find their way into otherwise acceptable fill material shall be removed during the dumping and spreading operations.
3. Broken rock and boulders larger than 6” in any dimension may not be used as fill without the specific approval of the Engineer.
4. Frozen soil shall not be used for fill.

C. Select Backfill

1. The upper 6-inches of soil placement is identified as Select Backfill.
2. Select Backfill material shall be from soil stockpile provided by Owner or from excavated materials by Contractor in sufficient quantity that meets the soil classification requirements for the Select Backfill.
3. Depending on the source, stockpiled material may be required to be screened with a mechanical screen to meet Grain Size requirements prior to placement.

D. Vegetative Support Layer

1. The purpose of the Vegetative Support Layer is to protect the geomembrane component of the cap system and to provide a soil layer for vegetative growth to reduce erosion of the landfill cap.

2. The Vegetative Support Layer will be placed on top of the geosynthetic component of the landfill cap system.

3. Depending on the source, stockpiled material may be required to be screened with a mechanical screen to meet Grain Size requirements prior to placement.

PART 3: EXECUTION

3.1 PREPARATION

A. Subgrade Preparation:

1. After removal of all existing topsoil, debris, and other undesirable material, the areas which are to receive fill, which have been cut to the desired grade, or which are at the approximate required subgrade elevation without additional earthwork, should be proofrolled to locate any soft or yielding area. Proofrolling shall be done with a smooth-drum roller (minimum 20 tons) making a minimum of two passes in each direction or other procedures and equipment approved by the Project Engineer.

2. Any soft, or excessively yielding material revealed by the proofrolling shall be removed and replaced with inert controlled fill. The Engineer shall be the sole judge of what constitutes soft or excessively yielding material.

3. Drainage from existing watercourses, springs or other sources should be rerouted out of the earthwork area. The Contractor shall take special care to remove all organically contaminated sediment, saturated soil, and other undesirable material from existing watercourses.

4. All soil material shall be tested Construction Quality Assurance (CQA testing firm and conform to Preconstruction Testing outlined below.

3.2 INSTALLATION

A. Structural Fill and Select Backfill Filling and Compaction:

1. After a stable non-yielding surface has been established, the surface of the area to be filled shall be scarified with a disc or harrow to a depth of 4” to 6”. An initial 3” layer of fill material shall then be spread over the scarified surface and the entire area compacted as specified below.

2. No fill shall be placed on any area until that area has been inspected and approved by the Engineer. Fill shall not be placed on a snow covered or frozen surface. Fill materials shall be spread in uniform horizontal layers not exceeding 8” in uncompacted thickness. Alternating layers of cohesive and granular fill soils shall not be permitted. Spreading and compacting of fill material should be started at the lowest portion of the site. All fill must be placed in horizontal layers. Sloping fill planes will not be permitted. Fill material shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form.

3. Keyways shall be provided at the toe of each fill slope as shown on the drawings. As each layer of fill meets the natural grade of a slope, a bench, approximately 7 to 8 feet wide, shall be cut into the existing grade with each layer of newly placed fill. If rock is encountered at the face of the natural grade, the original ground shall be cut in vertical steps of 4 to 5 feet and a horizontal bench cut into the rock at the top of each vertical increment. A horizontal plateau, approximately 15 to 20 feet wide, should be provided in the existing slope at vertical intervals of roughly 25 feet. Subsurface drains shall be installed at the toe of the slope and wherever springs or excessive seepage are encountered. Drains should be led to the outside face of the embankment and the water picked up and carried away in such a manner as to avoid softening the embankment or its toe, or producing erosion gullies.

4. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction. This may require aerating the material if it is too wet, or the addition of water if it is too dry. If additional water is required, it should be uniformly distributed through the use of approved water wagons and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.

5. All stockpiled Select Backfill and Vegetative Support material shall be screened with a mechanical screen, as required, to meet Grain Size requirements prior to placement.

6. Each layer of fill material shall be compacted and tested in accordance with the following requirements. Where, in the opinion of the Engineer, proposed fill material is too wet to permit drying in a reasonable length of time, the Engineer may reject the material and it must be removed from the work area. No additional compensation shall be provided to the Contractor for rejected material.

PRECONSTRUCITON QUALIFICATION STRUCTURAL FILL		
Test	ASTM Method	Quantity
Natural Moisture Content	D2216	1/5,000 YD^3
Laboratory Compaction	D698	1/5,000 YD^3

Preconstruction test samples shall be taken from the soil stockpile prior to construction.

STRUCTURAL FILL CRITERIA AND TESTING FREQUENCIES			
TEST	ASTM METHOD	QUANTITY	ACCEPTABLE VALUES
Field Density	D6938, D1556, D2937	1/40,000 SF/ Lift	95% maximum dry density
Field Moisture	D2216, D6938, D4643	1/40,000 SF/ Lift	+/- 4% optimum

PRECONSTRUCITON QUALIFICATION SELECT BACKFILL		
Test	ASTM Method	Quantity
Natural Moisture Content	D2216	1/5,000 YD^3
Laboratory Compaction	D698	1/5,000 YD^3
Grain Size Analysis	D422	1/5,000 YD^3

Preconstruction test samples shall be taken from the soil stockpile prior to construction.

SELECT BACKFILL (Upper 6-inches of Structural Fill) CRITERIA AND TESTING FREQUENCIES			
TEST	ASTM METHOD	QUANTITY	ACCEPTABLE VALUES
Field Density	D6938, D1556, D2937	1/40,000 SF/ Lift	95% maximum dry density
Field Moisture	D2216, D6938, D4643	1/40,000 SF/ Lift	+/- 4% optimum
Grain Size	D422, D1140	1/5000 YD^3	Max. 1” Diameter
Permeability	D5084	1/40,000 SF/ Lift	$1x10^{-4}$ cm/sec

PRECONSTRUCITON QUALIFICATION VEGETATIVE SUPPORT LAYER			
Test	ASTM Method	Quantity	ACCEPTABLE VALUES
Natural Moisture Content	D2216	1/5,000 YD^3	-
Laboratory Compaction	D698	1/5,000 YD^3	-
Grain Size Analysis	D422	1/5,000 YD^3	-
Permeability	D5084 (remolded)	1/10,000 YD^3	$1x10^{-5}$ cm/sec

Preconstruction test samples shall be taken from the soil stockpile prior to construction.

VEGETATIVE SUPPORT LAYER CRITERIA AND TESTING FREQUENCIES			
TEST	ASTM METHOD	QUANTITY	ACCEPTABLE VALUES
Field Density	D6938, D1556, D2937	1/40,000 SF/ Lift	92% maximum dry density (vegetative layer) 95% maximum dry density (tack-on berms)
Field Moisture	D2216, D6938, D4643	1/40,000 SF/ Lift	From +2% to +4% optimum
Grain Size	D422, D1140	1/5,000YD^3	Max. 2” Diameter

8. The above compaction requirements must be satisfied for all soil and weathered or soft rock fills. Weathered or soft rocks are those that can be broken down and disintegrated under normal compaction procedures and equipment.

9. At the close of each day's work, or where work is to be interrupted for a period of time, the surface of the site shall be shaped to drain freely, and sealed. If after a prolonged rainfall, the surface of the area to be filled or cut is too wet to work properly, the unsuitable material shall be removed to expose workable soil. The wet material removed may be dried and reused. Construction traffic shall be controlled so as to prevent rutting of graded areas and to avoid overrolling of any section.

10. All cut areas shall be rolled and compacted to produce a compaction equal to that of the filled area. If soft or yielding material is encountered in cuts, or fills as a result of trapping water, overrolling or improper control of construction traffic, and cannot be satisfactorily stabilized by moisture control, compaction or other means approved by the Engineer, the unstable material shall be excavated to the depth required by the Engineer. The excavation shall then be filled with suitable compacted material in accordance with the requirements outlined above.

B. <u>Special Requirements for Vegetative Support Layer Installation</u>

1. In addition to the installation requirements above, the installation of the vegetative support layer shall include the following.

2. The vegetative soil layer shall be placed with a minimum compacted thickness of 18 inches. Equipment used during placement of the vegetative soil layer shall not be allowed to operate directly on the geomembrane. Tracked equipment will not be allowed on any portion of the geomembrane without the protective geocomposite and a minimum of 18 inches of soil layer material in place. Soil material is to be pushed uphill beginning at the bottom of the slope and not to be placed and spread downhill. Soil layer material shall not be pushed along the surface of the geomembrane under any circumstances. Pushing of the soil layer material will only be allowed on areas where the material has a depth greater than 18 inches, and the required 18-inch depth shall be maintained at all times.

3. Placement of the vegetative support soil layer shall be performed by a light tracked dozer or light dump truck not in direct contact with the geomembrane. A minimum depth of 18 inches of soil layer material must be maintained at all times during placement activities when vehicles other than the light tracked dozer are needed. High traffic areas, such as access roads constructed to transport material into the landfill, should have a minimum depth of four (4) feet. This depth

may be changed by written approval from Owner or an engineered design approved by the Project Engineer.

4. The vegetative support layer shall be placed in the coolest part of the day when possible in order to reduce the potential for wrinkles forming in the geomembrane. See Sections 1.4.2 and 1.1.5 of Appendix C for information on evaluating and repairing wrinkles in the geomembrane.

5. The CQA Consultant will observe placement activities. The General Contractor is to provide laborers ahead of vegetative support layer material placement to assist in minimizing wrinkle formation of the geomembrane. Temperature variations may impact the Contractor's ability to place this material.

C. Grading:

1. Elevations shown on the plans are finished ground unless otherwise noted. Grading shall be maintained in such a manner as to provide free surface drainage of the site at all times without any ponding of water.

2. Provide ditches and swales to the cross-sections and grades shown on the drawings. Cut ditch subgrades 4" below the grades shown and provide 4" of topsoil where the plans call for seeding or sodding of the ditch. Keep ditches and swales free of accumulations of debris or washed in material until final acceptance of work by the Engineer.

3. Shape all surfaces to within not more than 2-inches above or below the required top of vegetative soil layer elevations and free from irregular surface changes.

C. Control and Testing:

1. The services of Construction Quality Assurance (CQA) testing firm will be employed by the Owner to verify that all earthwork has been completed in accordance with the Site Specific Construction Quality Assurance Plan.

2. If an independent testing firm is hired by the Contractor for the purpose of testing soil used in the construction of the landfill, the testing firm shall submit a field report to the Owner and Engineer at least once per week.

3. The Contractor shall cooperate with CQA testing personnel to allow proper inspection and control of the work without unnecessary delays. Contractor must notify CQA testing firm a minimum 24-hours before laboratory soil samples must be taken.

4. Laboratory test results may take up to 7 calendar days before test results are available. Contractor must include the time for laboratory testing in construction schedule.

D. Maintenance

1. The Contractor shall be responsible during construction and until final acceptance for the maintenance of all embankments made under the Contract.
2. During construction and until final acceptance; the Contractor shall construct temporary or permanent earth berms along the outer edges of the top surface of the embankment, construct temporary ditches, shape the embankment surface to provide for the drainage of surface runoff along and throughout the length of the embankments, and use any other methods necessary to maintain the work covered by this section so that the work will not contribute to excessive soil erosion. The Contractor shall construct brush dikes, or install temporary or permanent slope drains or other drainage features to assist in controlling erosion.
3. The Contractor shall replace, at no cost to the Owner, any portion of embankment which have become displaced or damaged due to carelessness or neglect on the part of the Contractor. Where the work has been properly constructed, completely drained and properly maintained, and damage occurs due to natural causes, the Contractor will be paid at the Contract unit price for the excavated material required to make necessary repairs to such damage.
4. All embankments shall be brought to the grade and cross section shown on the plans or established by the Engineer, prior to final inspection and acceptance by the Engineer.

3.3 VERFICATION SURVEYS

1. The Contractor shall provide a detailed topographic survey prepared by a registered North Carolina Professional Land Surveyor of the following conditions:
   - top of select backfill layer
   - top of vegetative support layer
2. After completion of each segment of earthwork, the surveys must be completed to verify quantities and thickness. The survey must be performed and stamped by a registered Professional Land Surveyor in the State of North Carolina.
3. A digital file including topographic survey drawing and digital elevation

model shall be provided to the Engineer in a format pre-approved by the Engineer. At a minimum, survey data shall be collected on a 50-foot grid and at least every 50-foot along all changes in grade or by Unmanned Aerial Vehicle (UAV) aerial photography and photogrammetry.

END OF SECTION

SECTION 312010 EXCAVATION AND BACKFILL

PART 1: GENERAL

1.01 SCOPE OF WORK

A. General:

1. The work covered by this section shall consist of furnishing all materials, labor, equipment and services for the excavation and backfill at all areas within the limits of the project. Work is limited to the areas of construction, and includes (but is not necessarily limited to) stockpiling of topsoil, site grading, excavation of footings and trenches, filling, backfilling, compaction, finish grading, spreading of topsoil, disposal of waste material, and proof rolling.

2. Perform all excavation, dewatering, sheeting, bracing, and backfilling in such a manner as to eliminate all possibility of undermining or disturbing the foundations of existing structures.

3. Requirements of the General and Supplemental Conditions apply to all work in this section. Provide all labor, materials, equipment, and services indicated on the drawings, or specified herein, or reasonably necessary for or incidental to a complete job.

4. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

5. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

6. Backfilling during freezing weather shall not be done except by permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

1.02 SYSTEM DESCRIPTION

A. Excavation, General: Excavation consists of the removal and disposal of all materials encountered for footings, foundations, pipework, and other construction as shown on the drawings. Perform all excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

1.03 QUALITY ASSURANCE

A. Referenced Standards: Unless otherwise indicated, all referenced standards shall be the latest edition available at the time of bidding. Any requirements of these specifications shall in no way invalidate the minimum requirements of the referenced standards. Comply with the provisions of the following codes and standards, except as otherwise shown or specified.

1. ASTM C33: Standard Specifications for Concrete Aggregate

2. ASTM D698: Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12" Drop.

3. ASTM D3282: Standard Recommended Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

4. Standard Specifications for Roads and Structures, North Carolina Department of Transportation, January 1, 2002 edition.

5. Erosion and Sediment Control Planning and Design Manual.

6. Site Specific Construction Quality Assurance Plan included in the appendix of these documents.

B. Unauthorized Excavation: Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced, by and at the expense of the Contractor, with concrete placed at the same time and monolithic with the concrete above.

C. Existing Utilities:

1. Locate existing underground utilities in the area of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of utility companies.

1.04 SITE CONDITIONS

A. Site Information: Test borings and other exploratory operations may be undertaken by the Contractor at his own expense, provided such operations are acceptable to the Owner.

PART 2: PRODUCTS

2.01 MATERIALS

A. Classification of Excavated Materials: Classification of excavated materials will be made as follows:

1. All materials excavated for this project regardless of its nature or composition shall be classified as:

   a. Earth Excavation: covered under the Earthwork unit price detailed on the Bid Schedule and all other excavation not associated with utility construction.

   b. Rock Excavation: defined in specification section 312020, and paid for by the rock excavation unit price.

   c. Undercut Excavation: Excavation of unsuitable soil as determined by the Engineer and disposed of onsite. Further defined in this section and paid for by the undercut excavation unit price.

B. Classification of Other Materials:

1. Satisfactory Subgrade Soil Materials: Soils complying with ASTM D 3282, soil classification Groups A-l, A-2-4, A-2-5, and A-3.

2. Unsatisfactory Subgrade Soil Materials: Soils described in ASTM D 3282, soil classification groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also peat and other highly organic soils, unless otherwise acceptable to the Engineer.

3. Cohesionless Soil Materials: Gravels, sand-gravel mixtures, sands, and gravelly-sands.

4. Cohesive Soil Materials: Clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clayey and silty sands, sand-silt mixtures, clays, silts, and very fine sands.

5. Backfill and Fill Materials: Provide satisfactory soil materials for backfill and fill, free of masonry, rock, or gravel larger than 4" in any dimension, and free of metal, gypsum, lime, debris, waste, frozen materials, vegetable, and other deleterious matter. Use only excavated material that has been sampled, tested, and certified as satisfactory soil material.

6. Select Backfill: Select backfill is defined as backfill and fill material that is transported from an area onsite, and which meets the soil requirements specified above under "Backfill and Fill Materials" and is used to replace the material removed as part of undercut excavation. Paid for under the unit price for Select Backfill.

7. Pipe Bedding: Crushed stone or crushed gravel meeting the requirements of ASTM C 33, Gradation 67.

8. Inundated Sand: Sand for inundated sand backfill shall be clean with not more than 25% retained on a No. 4 sieve and not more than 7% passing a No. 200 sieve and shall have an effective size between 0.10 mm and 0.30 mm. Sand shall be deposited in, or placed simultaneously with application of, water so that the sand shall be compacted by a mechanical probe type vibrator. Inundated sand shall be compacted to 70% relative density as determined by ASTM D4253 and D4254.

9. Graded Gravel: Gravel for compacted backfill shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
1"	100
3/4"	85 - 100
3/8"	50 - 80
No. 4	35 - 60
No. 40	15 - 30
No. 200	05 - 10

The gravel mixture shall contain no clay lumps or organic matters. The fraction passing the No. 4 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5. Gravel backfill shall be deposited in uniform layers not exceeding 12" in

uncompacted thickness. The backfill shall be compacted by a suitable vibratory roller or platform vibrator to not less than 70% relative density as determined by ASTM D4253 and D4254.

2.01 EQUIPMENT

A. Mechanical Excavation:

1. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

2. Mechanical equipment used for trench excavation shall be of a type, design, and construction and shall be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench, and that trench alignment is such that pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

PART 3: EXECUTION

3.01 PREPARATION

A. Dewatering:

1. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

2. All excavations for concrete structures or trenches that extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations 12” or more below the bottom of the excavation.

3. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches without causing damage to adjacent property.

4. The Contractor is responsible for obtaining any required permits or permissions necessary for the disposal of groundwater that is removed. Any discharged groundwater shall be clean and free of sediment.

5. The Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

6. Where trench sheeting is left in place, such sheeting shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed.

B. Stabilization:

1. Subgrades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; free from mud and muck; and sufficiently stable to remain firm and intact under the feet of the workmen.

2. Subgrades for concrete structures or trench bottoms, which are otherwise solid but which become mucky on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel. The stabilizing material shall be spread and compacted to a depth of not less than 6” below the bottom of the structure or pipe. Not more than 1/2” depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon. The finished elevation of stabilized subgrades for concrete structures shall not be above subgrade elevations indicated on the drawings.

D. Site Grade:

1. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finish the surface within specified tolerances; compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

2. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface. Shape the subgrade as indicated on the drawings by forking, furrowing, or plowing so that the first layer of new material placed thereon will be well bonded to it.

3.02 FIELD MEASUREMENTS

A. Alignment, Grade, and Minimum Cover:

1. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.

2. Where pipe grades or elevations are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation except where future surface elevations are indicated on the drawings.

B Limiting Trench Widths: Trenches shall be excavated to a width that will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment. For the purposes of quantity measurements and payments, maximum trench widths shall be no greater than the pipe outside diameter plus 24” (12” either side of pipe).

3.03 PROTECTION

A. Temporary Protection: Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Sheeting and Bracing: Make all excavations in accordance with Federal, State, and Local health and safety rules and regulations, including those promulgated by the Department of Labor, Occupation Safety and Health Administration, "Safety and Health Regulations for Construction".

Furnish, put in place, and maintain such sheeting, bracing, etc., as may be necessary to support the sides of the excavation to comply with the above mentioned rules and regulations.

C. Blasting:

1. The Contractor shall be responsible for all damage caused by blasting operations. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench.

2. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

D. Care and Restoration of Property:

1. Enclose the trunks of trees which are to remain adjacent to the work with substantial wooden boxes of such height as may be necessary to protect them from piled material, equipment or equipment operation. Use excavating machinery and cranes of suitable type and operate the equipment with care to prevent injury to remaining tree trunks, roots, branches and limbs.

2. Do not cut branches, limbs, and roots except by permission of the Engineer. Cut smoothly and neatly without splitting or crushing. In case of cutting or unavoidable injury to branches, limbs, and trunks of trees, neatly trim the cut or injured portions and cover with an application of grafting wax and tree healing paint as directed.

3. Protect by suitable means all cultivated hedges, shrubs and plants that might be injured by the Contractor's operations. Promptly heel in any such trees or shrubbery necessary to be removed and replanted. Perform heeling in and replanting under the direction of a licensed and experienced nurseryman. Replant in their original position all removed shrubbery and trees after construction operations have been substantially completed and care for until growth is reestablished.

4. Replace cultivated hedges, shrubs, and plants injured to such a degree as to affect their growth or diminish their beauty or usefulness, by items of kind and quality at least equal to the kind and quality existing at the start of the work.

5. Do not operate tractors, bulldozers or other power-operated equipment on paved surfaces if the treads or wheels of the equipment are so shaped as to cut or otherwise injure the surfaces.

6. Restore all surfaces, including lawns, grassed, and planted areas that have been injured by the Contractor's operations, to a condition at least equal to that in which they were found immediately before the work was begun. Use suitable materials and methods for such restoration. Maintain all restored plantings by cutting, trimming, fertilizing, etc., until acceptance. Restore existing property or structures as promptly as practicable and do not leave until the end of construction period.

E. Protection of Streams: Exercise reasonable precaution to prevent the silting of streams. Provide at Contractor's expense temporary erosion and sediment control measures to prevent the silting of streams and existing drainage facilities. The Contractor shall size structures and conform fully with the North Carolina Sedimentation Pollution Control Act.

F. Air Pollution:

1. Comply with all pollution control rules, regulations, ordinances, and statutes which apply to any work performed under the Contract, including any air pollution control rules, regulations, ordinances and statutes, or any municipal regulations pertaining to air pollution.

2. During the progress of the work, maintain the area of activity, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Engineer decides that it is necessary to use calcium chloride or more effective dust control, furnish and spread the material, as directed, and without additional compensation.

3.04 TRENCH EXCAVATION

A. Length of Trench:

1. No more trenches shall be opened in advance of pipe laying than is necessary to expedite the work. One block or 400 feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction.

2. Except where tunneling is indicated on the drawings, is specified, or is permitted by the Engineer, all trench excavation shall be open cut from the surface.

B. Trench Excavation:

1. General: Perform all excavation of every description and of whatever substance encountered so that the pipe can be laid to the alignment and depth shown on the drawings.

2. Brace and shore all trenches, where required, in accordance with Federal, State, and Local health and safety rules and regulations, including those promulgated by the Department of Labor, Occupation Safety and Health Administration, "Safety and Health Regulations for Construction".

3. Make all excavations by open cut unless otherwise specified or indicated on the drawings.

4. Width of Trenches: Excavate trenches sufficiently wide to allow proper installation of pipe, fittings and other materials. Measurement and payment quantities will be based on a maximum trench width of not more than 12” clear of pipe on either side at any point. Do not widen trenches by scraping or loosening materials from the sides.

5. Trench Excavation in Earth: Earth excavation includes all excavation of whatever substance encountered. In locations where pipe is to be bedded in earth excavated trenches, fine grade the bottoms of such trenches to allow firm bearing for the bottom of the pipe on undisturbed earth. Where any part of the trench has been excavated below the grade of the pipe, fill the part excavated below such grade with pipe bedding material and compact at the Contractor's expense.

6. Trench Excavation in Fill: If pipe is to be laid in embankments or other recently filled material, first place the fill material to the finish grade or to a height of at least one foot above the top of the pipe, whichever is the lesser. Take particular care to ensure maximum consolidation of material under the pipe location. Excavate the pipe trench as though in undisturbed material.

7. Trench Bottom in Poor Soil: Excavate and remove unstable or unsuitable soil to a width and depth, as directed by the Engineer, and refill with a thoroughly compacted gravel bedding.

8. Bell Holes: Provide bell holes at each joint to permit the joint to be made properly and to provide a continuous bearing and support for the pipe.

C. Trench Backfill:

1. General: Unless otherwise specified or indicated on the drawings, use suitable material for backfill which was removed in the course of making the construction excavations. Do not use frozen material for the backfill and do not place backfill on frozen material. Remove previously frozen material before new backfill is placed. Start backfilling as soon as practicable after the pipes have been laid, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, and proceed until its completion.

2. With the exception mentioned below in this paragraph, do not backfill trenches at pipe joints until after that section of the pipeline has successfully passed any specified tests required. Should the Contractor wish to minimize the maintenance of lights, and barricades, and the obstruction of traffic, he may, at his own risk, backfill the entire trench as soon as practicable after installation of pipe, and the related structures have acquired a suitable degree of strength. He shall, however, be responsible for removing and later replacing such backfill, at his own expense, should he be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.

3. Material: The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. Both are subject to the approval of the Engineer. Do not place stone or rock fragments larger than 4” in greatest dimension in the backfill. Do not drop large masses of backfill material into the trench in such a manner as to endanger the pipeline. Use a timber grillage to break the fall of material dropped from a height of more than 5 feet. Exclude pieces of bituminous pavement from the backfill unless their use is expressly permitted.

4. Zone Around Pipe: Place bedding material to the level shown on the Drawings and work material carefully around the pipe to insure that all voids are filled, particularly in bell holes. For backfill up to a level of 2 feet over the top of the pipe, use only selected materials containing no rock, clods or organic materials. Place the backfill and compact thoroughly under the pipe haunches and up to the mid-line of the pipe in layers not exceeding 6” in depth. Place each layer and tamp carefully and uniformly so as to eliminate the possibility of lateral displacement. Place and compact the remainder of the zone around the pipe and to a height of one foot above the pipe in layers not exceeding 6” and compact to a

maximum density of at least 100 % as determined by ASTM D0698.

5. Tamping: Deposit and spread backfill materials in uniform, parallel layers not exceeding 12" thick before compaction. Tamp each layer before the next layer is placed to obtain a thoroughly compacted mass. Furnish and use, if necessary, an adequate number of power driven tampers, each weighing at least 20 pounds for this purpose. Take care that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval of the Engineer, be compacted by the use of suitable rollers, tractors, or similarly powered equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling and compacting as furnished by the Contractor.

6. Wet the material by sprinkling, if necessary, to insure proper compaction by tamping (or rolling). Perform no compaction by tamping (or rolling) when the material is too wet either from rain or applied water to be compacted properly.

7. Trench Compaction: Compact backfill in pipe trenches to the maximum density as shown on the drawings, or as listed in the subsection entitled COMPACTION, with a moisture content within the range of values of maximum density as indicated by the moisture-density relationship curve.

3.05 SITE GRADE

A. Placement and Compaction:

1. Place backfill and fill material in layers not more than 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to the required percentage of maximum density for each area classification. Do not place backfill or material on surfaces that are muddy, frozen, or contain frost or ice.

2. In areas not accessible to rollers or compactors, compact the fill with mechanical hand tampers. If the mixture is excessively moistened by rain, aerate the material by means of blade graders, harrows, or other approved equipment, until the moisture content of

the mixture is satisfactory. Finish the surface of the layer by blading or rolling with a smooth roller, or a combination thereof, and leave the surface smooth and free from waves and inequalities.

3. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of backfill against structures. Carry the material uniformly around all parts of the structure to approximately the same elevation in each lift.

4. When existing ground surface has a density less than that specified under the subsection entitled COMPACTION for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

B. Grading Outside Building Lines: Grade to drain away from structures to prevent ponding of water. Finish surface free from irregular surface changes.

C. Planting Areas: Finish areas to receive topsoil to within not more than one inch (1") above or below the required subgrade elevations, compacted as specified, and free from irregular surface changes.

D. Walks: Shape the surface of areas under walks to line, grade, and cross-section, with the finish surface not more than 0" above or 1" below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.

E. Pavements:

1. Shape the surface of the areas under pavement to line, grade and cross section, with finish surface not more than 1/2" above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction.

2. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material.

3. Shape to line, grade, and cross section as shown on the drawings.

F. Protection of Graded Areas: Protect newly graded areas from traffic and erosion, and keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

G. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather prior to acceptance of work, scarify surface, reshape, and compact to required density prior to further construction.

H. Unauthorized Excavation:

1. Unauthorized excavation consists of the removal of materials beyond indicated elevations without the specific direction of the Engineer. Under footings, foundations, bases, etc., fill unauthorized excavation by extending the indicated bottom elevation of the concrete to the bottom of the excavation, without altering the required top elevation. Lean concrete fill may be used to bring elevations to proper position only when acceptable to the Engineer.

2. For pipe trenches and elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the Engineer.

3.06 BACKFILL AROUND STRUCTURES

A. General: Unless otherwise specified or indicated on the drawings, use suitable material for backfill which was removed in the course of making the backfill and do not place backfill which was removed in the course of making the construction excavations. Do not use frozen material for the backfill and do not place backfill upon frozen material. Remove previously frozen material before new backfill is placed.

B. Material: Approved selected materials available from the excavations may be used for backfilling around structures. Obtain material needed in addition to that of construction excavations from off-site borrow pits selected by the Contractor. Furnish all borrow material needed on the work. Place and compact all material, whether from the excavation or borrow, to make a dense, stable fill. Use fill material which contains no vegetation, masses of roots, individual roots over 18” long or more than 1/2” in diameter, stones over 4” in diameter, or porous matter. Organic matter must not exceed negligible quantities.

C. Placing Backfill: Do not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking, or other damage. Make special leakage tests, if required, as soon as practicable after the structures are structurally adequate and

other necessary work has been done. Use the best of the excavated materials in backfilling within 2 feet of the structure. Avoid unequal soil pressures by depositing the material evenly around the structure.

3.07 COMPACTION

A. General: Control soil compaction during construction providing at least the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements: After compaction, all fill will be tested in accordance with Method "C" of ASTM D-6938, unless specified otherwise. Except as noted otherwise for the zone around pipe, provide not less than the following percentages of maximum density of soil material compacted at optimum moisture content, for the actual density of each layer of soil material-in-place:

STRUCTURAL FILL	Compact Full Depth to 95%
TRENCH BACKFILL (ROADWAYS)	Compact full depth to 100%
TRENCH BACKFILL	Compact full depth to 95%
STOCKPILE AREAS	Compact full depth to 92%

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a satisfactory value, as determined by moisture-density relation tests.

D. Disposal of Surface Material: Upon approval of the Engineer, haul all surplus materials not needed or acceptable for backfill off-site.

3.08 FIELD QUALITY CONTROL

A. Soil Testing and Inspection Service: Compaction tests of all fill areas will be made by an independent testing laboratory. Such tests will be provided and paid for by the Owner, except that tests that reveal non-conformance with the specifications and all succeeding tests for the same area shall be at the expense of the Contractor until conformance with the specifications is established. The Owner will be responsible for paying for only the successful tests.

END OF SECTION

SECTION 312020 ROCK EXCAVATION

PART 1: GENERAL

1.01 SCOPE OF WORK

A. The work covered by this section consists of the blasting and excavation of rock material in cut areas. Rock excavation shall be classified material which cannot be removed with normal construction equipment such as hydraulic excavators, bulldozers with "rippers" and requires the construction practice of blasting or hammering.

1.02 DEFINITIONS

A. Rock is defined as being sandstone, limestone, flint, graphite, quartzite, slate, hard shale, or similar material that cannot be excavated without systematic drilling and blasting.

B. Should rock be encountered in two or more ledges, each ledge being not less than 3” thick and with interlying strata of earth, clay or gravel not more than 12” thick in each stratum, the entire volume between the top of the top ledge and the bottom of the bottom ledge will be classified as rock.

PART 2: NOT USED

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Blasting: The use of explosives shall conform to be in strict accordance with all Federal, State, County and local regulations and only after the approval of the Engineer. The Contractor shall be responsible for all damage caused by blasting operations. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of excavation or trench.

B. When rock is encountered, all lines and grades will be held in accordance with the plans or adjusted only after approval of the Engineer.

C. When rock is encountered within the limits of construction, the Contractor shall notify the Engineer prior to any removal. Upon the Engineer's authorization, the Contractor shall remove the rock. The Contractor shall not be paid for rock removed without prior approval from the Engineer.

D. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

END OF SECTION

SECTION 312050 LLDPE GEOMEMBRANE LINER

PART 1: GENERAL

1.01 SCOPE OF WORK

The Installer shall furnish all labor, materials, supervision and equipment to complete the LLDPE Geomembrane Liner including, but not limited to, anchor trench excavation and backfill, liner layout, seaming, patching, and all necessary and incidental items required to complete the Work, in accordance with the Contract Drawings and these Specifications.

1.02 WARRANTY

A. Installation shall be warranted against defects in workmanship for a period of 1-year from the date of geomembrane completion.

PART 2 PRODUCTS

2.01 LLDPE PROPERTIES

A. The textured geomembrane liner shall be made of linear low density polyethylene (LLDPE) that has an nominal thickness of 40 mils as outlined in GRI – GM17 Standard Specification. If during conformance testing or on-site testing and inspection, a thickness measurement is found to be less than 40 mils nominal, the material will be rejected for use during construction.

B. The geomembrane used shall meet, at a minimum, the standards included in Tables 1 and 2 located at the end of this section.

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

D. Geomembrane liner shall be shipped rolled with a protective wrap around each roll, labeled with roll number and manufacturer's batch number. Manufacturer's quality control documentation shall be included with each roll.

E. The geomembrane shall be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. Any such defect shall be repaired in accordance with the geomembrane manufacturer's recommendations. The Engineer may reject all or portions of units (or rolls) of the geomembrane if in his opinion significant quantities of production or transporting flaws are observed.

F. The Installer shall submit proposed geomembrane panel layouts to the Engineer at least 14 days prior to mobilization of crews. Once the panel layout is approved, the Installer may not change the layout without permission of the Engineer.

Table 1

Required Physical Properties of Textured Membrane Liner (LLDPE) Sheet

Property	Test Method	Required Values (40 Mil. LLDPE)
Thickness	ASTM D-5994	40 mil nominal
Sheet Density	ASTM D-1505	0.939 g/ml max
% Elongation at Break	ASTM D-6693 Type IV	250
Tensile Strength at Break	ASTM D-6693 Type IV	60 lb/in. min
Carbon Black Content	ASTM D-1603	2% min. - 3% max.
Carbon Black Dispersion	ASTM D-5596	1, 2, Category
Puncture Resistance	ASTM D-4833	44 lb. min.
Tear Resistance	ASTM D 1004	22 lb. min.

Seam Strengths

Shear Strength	ASTM D4437, NSF Modified	80 lb/in
Shear Strain @ Yield	ASTM D4437, NSF Modified	50 (min.)
Peel Strength (Fusion Weld)	ASTM D4437, NSF Modified	60 lb/in
Peel Strength (Extrusion Weld)	ASTM D4437, NSF Modified	52 lb/in

Non-Destructive Testing

Single Weld	Continuous Vacuum Box; Impact	Maintain vacuum of 3 psi, hold vacuum for 15 seconds.
Double Weld	Air Testing	Maintain 30 psi for no less than 5 min.; pressure loss not greater than 4 psi for last 5 minutes.

Table 2

Required Pre-Shipping Sheet Testing of Textured Membrane Liner (LLDPE)

Property	Test Method	Frequency
Thickness	ASTM D-5994	Each Roll
Sheet Density	ASTM D-1505	Every 5th roll
Tensile Properties	ASTM D-6693 Type IV	Every 5th roll
Tear Resistance	ASTM D-1004	Every 5th roll

Puncture Resistance	ASTM D-4833	Every 5th roll
Carbon Black Content	ASTM D-1603	Every 5th roll
Carbon Black Dispersion	ASTM D-5596	Every 5th roll

PART 3 EXECUTION

3.01 CONSTRUCTION

A. The geomembrane liner shall be installed by a specialty contractor, and that specialty contractor must have installed a minimum of 4,000,000 square feet of geomembrane liner.

B. The geomembrane liner shall be constructed as soon as practical after completion and approval of the subgrade earthworks or portion thereof. The top of the subgrade earthworks will be surveyed to ensure adequate thickness of soil cover over wastes and proper grades. The Contractor shall be responsible for providing survey information for the purpose of depth verification. The Contractor shall be responsible for providing a panel layout survey of the geomembrane, including all destructive testing locations, defects, and repairs. All survey information must be performed and stamped by a registered Professional Land Surveyor in the State of North Carolina. The survey information shall be provided to the Engineer in a format pre-approved by the Engineer and acceptable to the North Carolina Solid Waste Division. The geomembrane is to cover the landfill cap and the side slopes in accordance with the Contract Drawings.

C. Areas to receive liner installation shall be relatively smooth and even, free of ruts, voids, etc., to the extent required by the Engineer. This shall be accomplished by final dressing of the compacted subgrade with smooth drum rollers. No vehicles are permitted on final dressed surfaces unless authorized by the Engineer.

D. The liner edges are illustrated on the Contract Drawings, and will be utilized to secure the geomembrane in certain areas of the landfill cap and to control stormwater runoff. No loose soil will be allowed to underlie the geomembrane on the liner edges. The time schedule for excavation and backfilling of the liner edges is to be approved by the Engineer so that desiccation of trench soils does not occur prior to backfilling.

3.02 INSTALLATION

A. All geomembrane installed on the landfill cap will be 40 mil textured material.

B. Unroll only those sections that are to be seamed together in one day. Panels should be positioned with the overlap recommended by the

manufacturer, but not less than 4 inches. The side slope geomembrane will be placed in an anchor trench that is then backfilled with soil and compacted as shown on the Contract Drawings. Internal temporary anchor trenches may be required, and shall be installed per the manufacturers recommendations.

C. After panels are initially in place, remove wrinkles as directed by the Engineer. Unroll several panels and allow the liner to "relax" before beginning field seaming. The purpose of this is to make the edges, which are to be bonded, as smooth and free of wrinkles as possible.

D. Once panels are in place and smooth, commence field seaming operations.

E. The Installer's Field Superintendent will complete a Daily Report at the end of each day and submit the form daily to the engineer.

F. Field seaming shall be in accordance with EPA Technical Guidance document: "The Fabrication of Polyethylene FML Field Seams" EPA/530/SW-89/069 or as follows. Where conflicts exist between the two guidance specifications, the most stringent specification prevails or as directed by the Engineer

G. All foreign matter (dirt, water, oil, etc.) shall be removed from the edges to be bonded. For extrusion welds, the bonding surfaces must be thoroughly cleaned by mechanical abrasion or alternate methods approved by the Engineer to remove surface cure and prepare the surfaces for bonding. All abrasive buffing shall be performed using No. 80 grit or finer sandpaper. The grinding shall be performed so that any and all grind marks are perpendicular to the edge of sheet. No grinding greater than 1/8 inch outside the welds is permitted or the Engineer can require patching. No solvents shall be used to clean the geomembrane liner.

H. As much as practical, field seaming shall start from the top of the slope down. This will minimize large wrinkles from becoming trapped, which requires cutting and patching. Tack welds (if used) shall use heat only; no double sided tape, glue, or other method will be permitted. The geomembrane should be seamed completely to the ends of all panels to minimize the potential of tear propagation along the seam.

I. The completed liner shall not exhibit <u>any</u> "trampolining" during any daylight hours (6:00 a.m. to 8:00 p.m.). All areas exhibiting trampolining must be repaired as directed by the Engineer.

J. At the end of each day or installation segment, all unseamed edges shall be anchored by sand bags or other approved device. If high winds are expected, boards along the edge of unseamed panels, with weighted sand bags on top, may be used to anchor the geomembrane. Staples, U-shaped rods or other penetrating anchors shall not be used to secure the geomembrane. Any damage to the liner or select backfill including

damage due to wind, rain, hail, or other weather shall be the sole responsibility of the Contractor.

K. Field seaming may be extrusion or fusion welding or a combination of these methods. Solvent welding is not acceptable. The Engineer reserves the right to reject any proposed seaming method it believes unacceptable. Double hot wedge fusion welding shall be the predominant seaming method and shall be used when possible. Additional concepts and requirements of proper field seaming include the following.

L. Extrusion welding applies a molten bead of material to preheated sheets of geomembrane. The sheets are then joined by pressure.

M.]The fusion welding process heats the area to be joined to the melting point and then applies pressure to join the melted surfaces.

N. The sheets to be joined shall be overlapped at least four (4) inches after the necessary cleaning, aligning and cutting.

O. The seams should be oriented parallel to the line of maximum slope, i.e., oriented up and down, not across, the slope. In corners and odd shaped geometric locations, the number of field seams shall be minimized.

P. No horizontal seams shall be within ten (10) feet from the toe of the slope. No horizontal seams will be allowed on the side slopes unless approved by the Engineer.

Q. No seaming shall be attempted above 40°C (104°F) ambient air temperature. Below 5°C (41°F) ambient air temperature, preheating of the geomembrane will be required, unless it is demonstrated that this is not necessary (i.e., acceptable test (start-up) seams which duplicate, as closely as possible, actual field conditions can be achieved). Preheating may be achieved by natural and/or artificial means (shelters and heating devices). Ambient temperature is measured 18 inches above the liner surface. The Installer shall supply instrumentation for measurement of ambient temperature.

R. A moveable protective layer of plastic or approved material may be placed directly below each overlap of geomembrane that is to be seamed. This is to prevent any moisture build-up between the sheets to be welded. The protective layer must be removed after welding.

S. Seaming will extend to the outside edge of panels to be placed in anchor trenches.

T. If required, a firm substrata should be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

U. Grinding prior to welding shall be done perpendicular to the sheet edge. Overgrind greater than 1/8 inch beyond the welded seam or improperly ground areas shall be replaced at the Installer's expense.

3.03 SEAMS AT THE PANEL CORNERS

A. Seams at the panel corners of 3 or 4 sheets shall be completed with a circular patch approximately 12 inches in diameter, extrusion welded to the parent sheets.

3.04 QUALITY CONTROL

A. All geomembrane sheet, seams, and patches will be tested and evaluated prior to acceptance. In general, testing of the sheet will be conducted by the manufacturer. Testing of the seams will be conducted by the Installer under observation by the Engineer. The Engineer or a designated, independent geosynthetics laboratory may perform additional testing, as required by these detailed Specifications or as required in the judgment of the Engineer or Authorized Representative to verify that the LLDPE sheet and seams meet the specifications. The geosynthetics installer will be required to adhere to the requirements of the Site Specific Construction Quality Assurance Plan. Testing requirements are detailed in the following subsections:

3.05 PRE-SHIPPING SHEET TESTS

A. The Installer or supplier (manufacturer) will be required to submit his Quality Control program to the Owner prior to initiating field work. At a minimum, the Manufacturer will perform the tests, at the frequencies given in Table 2, on the LLDPE sheet prior to shipping LLDPE material to the site.

3.06 TEST SEAMS (DESTRUCTIVE TESTS)

A. The Installer shall maintain and use equipment and personnel at the site to perform testing of test seams. These seams will be made on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. At a minimum, test seams shall be made upon each start of work for each seaming crew, upon every four hours of continuous seaming, every time seaming equipment is changed or if significant changes in geomembrane temperature and weather conditions are observed. The technician shall complete the Test Seam Form provided by the Engineer immediately after each test. Requirements for test seams are as follows:

B. The test seam sample will be at least 1.8m (6 feet) long by 0.3m (1 foot) wide with the seam centered lengthwise. Six adjoining specimens 25mm (1 inch) wide each will be cut from the test seam sample. At the Engineer's option, the shear tests may be eliminated for test seams. These specimens will be tested in the field with a tensiometer and/or manual seam tester for both shear (3 specimens) and peel (3 specimens). For dual wedge both inside and outside welds should be tested in the peel. Test seams will be tested by the Installer under approval of the Engineer. The specimens should not fail in

the weld. The Installer shall supply all necessary knowledgeable personnel and testing equipment. Quantitative strength measurements from a calibrated field tensiometer, supplied by the Installer, shall be obtained for all three (3) specimens in shear and peel for the test seams. A passing test seam will be achieved when the criteria described in Table 1 (located at the end of this section) are satisfied. If a test seam fails, the entire operation will be repeated. If the additional test seam fails, the seaming apparatus or seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful full test seams are achieved. Test seam failure is defined as failure of any one of the specimens tested in shear or peel.

C. The Engineer will approve all test seam procedures and results. The six (6) test specimens shall be labeled with initials of the technician, date, and A.M. or P.M. as appropriate; bound together with electrical tape; and retained by the Engineer until the project is over. The Engineer will transfer these specimens to the Owner following the Engineer's acceptance of the geomembrane materials and installation.

3.07 PRODUCTION SEAMS

A. One hundred percent of the production seams will be tested by the Installer continuously using non-destructive techniques and at specified intervals using destructive tests.

B. All areas failing nondestructive test procedures described below shall be clearly marked both on the liner itself and on the Seam Inspection Quality Control Form.

3.08 NON-DESTRUCTIVE TESTING

A. Single Weld Seams: The Contractor shall maintain and use equipment and personnel at the site to perform continuous vacuum box testing on all single weld production seams except those corner seams where vacuum box testing is impossible. The system shall be capable of applying a vacuum of at least 3 psi. The vacuum shall be held for a minimum of 15 seconds for each section of seam. All vacuum boxes to be used at this job site shall have new gaskets installed prior to reaching the job site. The geosynthetics installer shall also be required to have backup vacuum testing equipment at the job site. If the geosynthetics installer fails to provide the backup equipment, and it results in delays of the project, the geosynthetics installer will be liable for all costs associated with the delay.

B. Double Weld Seams: The Contractor shall maintain and use equipment and personnel to perform air pressure testing of all double weld seams. The system shall be capable of applying a pressure of at least 30 psi for not less than 5 minutes. All channels between the double weld seam must first be verified that the channel is open throughout the entire test area. The air pressure test results shall be documented. Pressure loss tests shall be

conducted in accordance with the procedures outlined in “Pressurized Air Channel Test for Dual Seamed Geomembranes,” Geosynthetic Research Institute Test Method GM-6. As outlined by the test method, following a 2 minute pressurized stabilization period, pressure losses over a measurement period of 5 minutes shall not exceed 4 psi.

C. Double weld seams will also be visually inspected on 100 percent of the seam. If necessary, the outside flap can be pulled back to aid in the visual inspection.

3.09 DESTRUCTIVE TESTING

A. Laboratory destructive testing (LDT) is defined as 12” X 48” samples cut on 500 foot centers for both extrusion and double welded seams. Field destructive testing (FDT) is defined as 3” X 6” samples cut at the end of each seamed area exceeding 200 feet. Both are described below.

B. Laboratory destructive testing will be performed on an average of every 500 linear feet of production seam. The locations will be selected by the Engineer. Samples will be 12” X 48” in order to provide one sample to the archive, one sample to the Engineer for laboratory testing, and one sample to be retained by the Installer for possible field and/or additional laboratory testing at the option of the Installer.

C. Before the sample is sent to the laboratory, two specimens, one from each end of the specimen will be tested in peel in a calibrated field tensiometer, supplied by the Installer. Both specimens must meet the qualitative and quantitative criteria listed in Tables 1 and 2. Testing requirements are as follows: Each sample shall be large enough to test five specimens in peel and five specimens in shear. The average values of each set of five specimens must meet the values shown in Tables 1 and 2. If the average of the five specimens is adequate, but one of the specimens is below the required value, values for the specimen must be at least 90% of the values required for the sample to pass. All samples must fail in film tear bond (FTB). Samples which do not pass the shear and peel tests will be re-sampled from locations at least 10 feet on each side of the original location. These two re-test samples must pass both shear and peel testing. If these two samples do not pass, then the entire seam represented by the test shall be capped. Tests shall be conducted using a calibrated tensiometer and must meet the criteria outlined in Tables 1 and 2 located at the end of this section. The Owner will pay for destructive testing of the original destructive samples. The geosynthetics installer will be responsible for all costs associated with resampling and retesting for failing destructive samples beyond a 5% failure rate by quantity. This includes the cost of lab and CQA personnel. The minimum charge for each destructive re-test exceeding the 5% failure rate will be $500.00 per occurrence.

D. Field Destructive Testing (FDT) shall be small 2” X 6” samples cut out at the beginning and end of each seam exceeding 200 feet in length. Three 1” X 6”

specimens will be tested in peel from each sample using the Installer's Field Tensiometer or qualitative peel tester at the option of the Installer. No qualitative peel strength values need to be determined with the Field Destructive test, but each specimen must be all qualitative criteria listed in Tables 1 and 2.

E. The Engineer will approve all seam field and laboratory test procedures and results. All laboratory destructive test specimens will be marked with the seam number and letters then bound together for a particular seam and stored in the Owner's archives. The specimens for the FDT need not be retained.

F. Each sample area will be clearly marked both on the liner itself (LDT or FDT).

G. All areas cut out for testing shall be immediately patched by the Installer.

3.10 REPAIR OF DAMAGED AND SAMPLED AREAS

A. Damaged and sample coupon areas of geomembrane shall be repaired by the Installer by construction of an extrusion welded cap strip. No repairs shall be made to seams by application of an extrusion bead to a seam edge previously welded by fusion or extrusion methods. Repaired areas will be tested for seam integrity as outlined in Section 02623.27 of this specification. Damaged materials are the property of the Contractor and will be removed from the site at the Contractor's expense. The Contractor will retain all ownership and responsibility for the geomembrane until acceptance by the Engineer. The geomembrane shall be accepted by the Engineer after the installation and repair are complete, and after the Engineer has received documentation for the installation.

3.11 POTENTIALLY DAMAGING ACTIVITIES

A. No support equipment of any type, which may be used by the Contractor, shall be allowed on the geomembrane. Personnel working on the geomembrane shall not smoke, wear damaging shoes, or engage in any activity that could damage the geomembrane. No glass or sharp objects shall be allowed on the geomembrane.

3.12 PROTECTION OF LEADING EDGES

A. Between construction of partial sections of the membrane liner, excluding temporary phaselines, leading edges of the membrane may be exposed or buried for extended periods of time prior to their joining to adjacent, subsequent membrane sections. The combined action of abrasive soil and equipment impact stresses may "etch" unprotected membrane surfaces sufficiently to affect seam strengths. Therefore, it is necessary to protect leading edges in high activity areas with sacrificial layers of geotextile and LLDPE sheet until they are ready for final seaming. As a minimum, each

leading edge to be seamed that must be buried or which must be exposed for periods of one month or longer shall be continuously covered by a layer of LLDPE sheet. The geotextile shall be nonwoven and have a minimum weight of 8 oz. per square yard. The sacrificial LLDPE sheet shall have a minimum thickness equal to that of the membrane liner to be protected. Both protective layers shall have a minimum width of 2 feet. The protective cover sheets shall be either covered with soil or weighted with sand bags to prevent displacement by wind. The edge of the sheet to be protected shall be approximately centered beneath the overlying protective layers prior to burial or weighing with sandbags. Leading edges located in areas expected to receive direct traffic from construction equipment shall be buried under a minimum thickness of one foot of buffer soil.

END OF SECTION

SECTION 312055 GEOCOMPOSITE DRAINAGE LAYER

PART 1: GENERAL

1.01 SCOPE OF WORK

Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of the geocomposite drainage layer.

1.02 WARRANTY

A. Installation shall be warranted against defects in workmanship for a period of 1-year from the date of geocomposite completion.

PART 2: PRODUCTS

2.01 GEOCOMPOSITE PROPERTIES

A. A geocomposite shall be manufactured by extruding two crossing strands to form a bi-planar drainage net structure with a non-woven geotextile bonded to one or both sides.

B. The geocomposite specified shall have properties that meet or exceed the values listed in the following Table:

Standard Property Geocomposite Drainage Sheet		
Tested Property	**Test Method**	**MINIMUM AVERAGE VALUES[c]**
Geocomposite		
Transmissivity[a], gal/min-ft	ASTM D4716	4.3
Ply Adhesion, lb/in	ASTM D7005	1
Geonet		
Transmissivity[a], gal/min-ft	ASTM D4716	38.6
Thickness, mil	ASTM D 5199	300
Density, g/cm^3	ASTM D 1505 or ASTM D792, Method B	0.94
Peak Tensile Strength (MD), lb	ASTM D7179	75
Carbon Black Content, %	ASTM D 1603	2.0 – 3.0

Geotextile Component		
Mass Per Unit Area, oz/yd^2	ASTM D 5261	8
AOS, US Sieve	ASTM D 4751	70
Grab Tensile Strength	ASTM D 4632	160
Grab Tensile Elongation	ASTM D 4632	50
Puncture Strength	ASTM D 6241	435
Permittivity (min. avg.) (Sec^{-1})	ASTM D 4491	1.5
UV Stability, % retained (500 hr.)	ASTM D 4355	50

(a) Gradient of 0.1, normal load of 10,000 psf, water at 70°, between stainless steel plates and a 15-minute seat time.
(b) Component properties prior to lamination.
(c) These are MARV values that are based on the cumulative results of specimens tested.

C. Resin
1. Resin shall be new first quality, compounded polyethylene resin.

PART 3: EXECUTION

3.01 FAMILIARIZATION

A. Inspection
1. Prior to implementing any of the work in the Section to be lined, the Installer shall carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of the Section may properly commence without adverse impact.

2. If the Installer has any concerns regarding the installed work of other Sections, he shall notify the Project Engineer.

B. Confirmation Testing

The friction angle between the geocomposite and the textured geomembrane shall be a minimum of 27 degrees. The Contractor shall verify prior to beginning construction. The test method used to verify the interface friction angle between the geocomposite and the textured geomembrane shall be ASTM D5321 *Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by Direct Shear Method*. Test parameters are to provide 3 points to range over minimum and maximum expected normal loads. Minimum will be a construction load of 260 psf. Maximum will be

at the landfill's final filled condition or approximately 1,423 psf. The normal loadings used shall be 250, 750 and 1,500 psf.

3.02 MATERIAL PLACEMENT

A. The geocomposite roll should be installed in the direction of the slope and in the intended direction of flow unless otherwise specified by the Engineer.

B. If the project contains long, steep slopes, special care should be taken so that only full length rolls are used at the top of the slope.

C. In the presence of wind, all geocomposites shall be weighted down with sandbags or the equivalent. Such sandbags shall be used during placement and remain until replaced with cover material.

D. If the project includes an anchor trench at the top of the slopes, the geocomposite shall be properly anchored to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.

E. In applying fill material, no equipment can drive directly across the geocomposite. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure.

F. The cover soil shall be placed in the geocomposite in a manner that prevents damage to the geocomposite. Placement of the cover soil shall proceed immediately following the placement and inspection of the geocomposite.

3.03 SEAMS AND OVERLAPS

A. Each component of the geocomposite will be secured or seamed to the like component at overlaps.

B. Geonet Components

1. Adjacent edges of the geonet along the length of the geocomposite roll shall be placed with the edges of each geonet butted against each other.

2. The overlaps shall be joined by tying the geonet structure with cable ties. These ties shall be spaced every 3 feet along the roll length.
3. Adjoining geocomposite rolls (end to end) across the roll width should be shingled down in the direction of the slope, with the geonet portion of the top overlapping the geonet portion of the bottom geocomposite a minimum of 12 inches across the roll width.
4. The geonet portion should be tied every 6 inches in the anchor trench or as specified by the Engineer.

3.04 REPAIR

A. Prior to covering the deployed geocomposite, each roll shall be inspected for damage resulting from construction.

B. Any rips, tears or damaged areas on the deployed geocomposite shall be removed and patched. The patch shall be secured to the original geonet by tying every 6 inches with the approved tying devices. If the area to be repaired is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be joined in accordance with Subsection 3.03.

END OF SECTION

SECTION 312230 AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work covered by this section consists of the construction of a base composed of an approved aggregate material hauled to the site, placed on the site, compacted, and shaped to conform to the lines, grades, depths, and typical sections shown on the plans or established by the Engineer.

B. Related Sections:

1. Division 31 Section “Earthwork”.
2. Division 32 Section “Bituminous Paving”.
3. Division 33 Section “Sanitary Sewer Pipe and Appurtenances”.
4. Division 33 Section “Storm Drainage Materials”.

1.3 PERFORMANCE REQUIREMENTS

A. The work under this section consists of furnishing all materials, labor, equipment, incidentals and services required for the complete installation of aggregate base course materials in the locations shown on the drawings and as specified herein.

B. All work in connection with installing aggregate base course materials shall comply with all current requirements of authorities having jurisdiction. The Contractor is responsible for being familiar with and adhering to these requirements.

C. The Contractor shall inspect the locations of the proposed work associated with this Section and shall familiarize themselves with the conditions under which the work will be performed, and with all necessary details and the suitability of their equipment and methods for the work required. The omission of any installation details which may not appear within the Contract Documents shall not relieve the Contractor of full responsibility for completing the work as necessary.

D. Construction shall be done in such a manner that will not interfere with the operation of any street, highway, railway, or other facility nor weaken or damage any embankment or structure. Barricades and lights shall be furnished and maintained to safeguard traffic and pedestrians as required by authorities having jurisdiction until such time as the operation has been completed.

1.4 SUBMITTALS

A. Product Data and certificates: For all aggregate base course materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall utilize methods of handling, hauling, and placing which will minimize segregation and contamination of the aggregate used for the base course. If segregation occurs, the Engineer may require that changes be made in the Contractor's methods and may also require remixing of the aggregate to achieve the proper mixture. No additional compensation will be made for remixing, additional equipment, or other measures necessary to provide the coarse aggregate base course specified. Aggregate which becomes contaminated with foreign materials to the extent that the base course will not serve its intended use shall be removed and replaced by the Contractor at no additional expense to the Owner. The above requirements will be applicable regardless of the type of aggregate placed and regardless of prior acceptance.

1.6 COORDINATION

A. For all work within the Department of Transportation right-of-way, the Contractor shall notify the appropriate office of the Department of Transportation at least 72 hours prior to beginning construction.

1.7 WARRANTY

A. All materials shall be warranted to be free from defects in workmanship and materials for one (1) year following final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Aggregate base course materials shall consist of crushed stone or uncrushed gravel, or other similar material having hard, strong, durable particles free of adherent coatings meeting the requirements of the NCDOT Standard

Specifications for Roads and Structures, latest edition for the project-specific use of the aggregate.

B. The Contractor shall furnish aggregate base course material produced in accordance with the requirements indicated herein for Type A, aggregate unless otherwise specified in the special provisions.

C. All aggregates shall be from approved sources. Sources will not be approved unless the material has satisfactory soundness and satisfactory resistance to abrasion. Satisfactory soundness will be considered to be a weighted average loss of not greater than 15 percent when subjected to five (5) alternations of the sodium sulfate soundness test in accordance with AASHTO T104. Satisfactory resistance to abrasion will be considered to be a percentage of wear of not greater than 55 percent when tested in accordance with AASHTO T96.

D. Aggregates shall be handled in such a manner as to minimize segregation

E. Sites for aggregate stockpiles shall be grubbed and cleaned prior to storing aggregates, and the ground surface shall be firm, smooth, and well drained. A cover of at least 3" of aggregate shall be maintained over the ground surface in order to avoid the inclusion of soil or foreign material. Stockpiles shall be built in such a manner as to minimize segregation. When it is necessary to operate trucks or other equipment on a stockpile in the process of building the stockpile, it shall be done in a manner approved by the Engineer.

F. Stockpiles of different types or sizes of aggregates shall be spaced far enough apart, or else separated by suitable walls or partitions, to prevent the mixing of the aggregates.

G. Any method of stockpiling aggregates which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has been operated, and failure of such samples to meet all grading requirements for the aggregate will be considered cause for discontinuance of such stockpiling procedure.

H. Gradation: All standard sizes of aggregates shall meet the gradation requirements when tested in accordance with AASHTO T27.

2.2 WATER

A. Water, if used in construction, shall be potable water, free from oil and other deleterious matter.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. The subgrade shall be dry and cleaned of all foreign substances prior to constructing the base course.

B. The surface of the subgrade shall be prepared as specified in Section 312000 “Earth Moving” based on the specified use of the aggregate base course.

3.2 PLACEMENT OF STONE BASE

A. The aggregate material shall be spread on the subgrade to a uniform loose depth and without segregation.

B. Where the required compacted thickness of base is 10 inches or less the base material may be spread and compacted in one layer. Where the required compacted thickness of base is more than 10 inches, the base material shall be spread and compacted in two (2) or more approximately equal layers. The minimum compacted thickness of any one layer shall be approximately 4 inches.

C. Each layer of material shall have been sampled, tested, compacted, and approved prior to placing succeeding layers of base material or pavement. Such tests will be provided and paid for by the Owner, except that tests which reveal non-conformance with the Specifications and all succeeding tests for the same area, until conformance with the Specifications is established shall be at the expense of the Contractor. The Owner will be responsible for paying for only the successful tests. The minimum compaction for each layer shall be 100% standard proctor.

D. No base material shall be placed on frozen subgrade or base. Hauling equipment shall not be operated on subgrade or a previously completed layer of base material soft enough to rut or weave beneath the equipment.

E. The maximum speed of trucks hauling or traveling over any part of the subgrade or base shall be five (5) miles per hour.

3.3 QUALITY CONTROL

A. Weather and Temperature Limitations:

1. Coarse aggregate base course shall not be placed during rainy weather or on wet or frozen subgrade.

2. Stabilized aggregate base courses shall not be constructed when the atmospheric temperature is below thirty-five (35) degrees F. when measured in the shade away from artificial heat.
3. Any areas of completed base course that are damaged by elements such as rain, sleet, snow, hail, or freeze/thaw conditions shall be reconditioned, reshaped, and compacted in accordance with the Drawings and these Specifications.

B. Tolerances:

1. After final shaping and compacting the base, the Engineer will check the surface of the base for conformance to grade and typical section and will determine the base thickness.
2. The thickness of the base shall be within a tolerance of ±1/2-inch of the base thickness required by the plans.

C. Maintenance:

1. Where the base material is placed in a trench section, the Contractor shall provide adequate drainage through the shoulders to protect the subgrade and base until such time as shoulders are completed.

2. The Contractor shall maintain the surface of the base by watering, machining, and rolling or dragging when necessary to prevent damage to the base by weather or traffic.

1. Where the base or subgrade is damaged, repair the damaged area; reshape the base to required lines, grades and typical sections; and recompact the base to the required density at no cost to the Owner.

END OF SECTION 312230

SECTION 312271 RIP RAP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work to be performed under this Specification shall consist of furnishing and installing all materials and equipment and performing all labor required to install rip rap and associated appurtenances as specified herein.

B. Related Sections:
   1. Division 33 Section “Storm Drainage Materials”.

1.3 PERFORMANCE REQUIREMENTS

A. The work under this section consists of furnishing all materials, labor, equipment, incidentals and services required for the complete installation of rip rap and geotextiles materials in the locations shown on the drawings and as specified herein.

B. All work in connection with installing rip rap and associated geotextile materials shall comply with all current requirements of authorities having jurisdiction. The Contractor is responsible for being familiar with and adhering to these requirements.

C. The Contractor shall inspect the locations of the proposed work associated with this Section and shall familiarize themselves with the conditions under which the work will be performed, and with all necessary details and the suitability of their equipment and methods for the work required. The omission of any installation details which may not appear within the Contract Documents shall not relieve the Contractor of full responsibility for completing the work as necessary.

D. Construction shall be done in such a manner that will not interfere with the operation of any street, highway, railway, or other facility nor weaken or damage any embankment or structure. Barricades and lights shall be furnished

and maintained to safeguard traffic and pedestrians as required by authorities having jurisdiction until such time as the operation has been completed.

1.4 SUBMITTALS

A. Product Data and certificates: For all rip rap and geotextile materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall coordinate material deliveries with the manufacturer/supplier. All materials shall be handled and stored in accordance with the manufacturer's recommendations using methods that will prevent damage to the materials.

B. The Contractor shall load, transport, unload and store geotextiles so they are kept clean and free of damage. Label and store geotextiles in accordance with Section 7 of AASHTO M288. Geotextiles with defects, flaws, deterioration or damage will be rejected. Do not unwrap geotextiles until just before installation.

1.6 COORDINATION

A. For all work within the Department of Transportation right-of-way, the Contractor shall notify the appropriate office of the Department of Transportation at least 72 hours prior to beginning construction.

1.7 WARRANTY

A. All materials shall be warranted to be free from defects in workmanship and materials for one (1) year following final acceptance by the Owner.

PART 2 - PRODUCTS

2.1 GEOTEXTILES

A. When indicated for use on the Drawings, geotextiles used in conjunction with the placement of rip rap shall possess the following properties.

1. Elongation: ≥ 50 percent in accordance with ASTM D4632.
2. Grab Strength: 205 pounds in accordance with ASTM D4632.
3. Tear Strength: 80 pounds in accordance with ASTM D4533.
4. Puncture Strength: 440 pounds in accordance with ASTM D6241.
5. Permittivity: 0.20 sec-1 in accordance with ASTM D4491.
6. Apparent Opening Size: #60 in accordance with ASTM D4751.

7. UV Stability (Retained Strength after 500 hours of exposure): 50 percent in accordance with ASTM D4355.

B. When required, sew geotextiles together in accordance with Article X1.1.4 of AASHTO M288. Provide sewn seams with seam strengths meeting the required strengths of the geotextile specified herein.

2.2 RIP RAP

A. Rip rap shall be field stone or rough unhewn quarry stone which is sound, tough, dense, resistant to the action of air and water and suitable in all other respects for the purpose intended. Where broken concrete from demolished structures or pavement is available, it may be used in place of stone provided that such use meets with the approval of the Engineer. However, the use of broken concrete that contains reinforcing steel will not be permitted.

B. All stone shall meet the approval of the Engineer. While no specific gradation is required, there shall be equal distribution of the various sizes of the stone within the required size range. The size of an individual stone particle will be determined by measuring its long dimension.

C. Stone or broken concrete for rip rap shall meet the table below for the class shown on the drawings.

ACCEPTANCE CRITERIA FOR RIP RAP AND STONE FOR EROSION CONTROL			
Class	Minimum	Midrange	Maximum
A	2	4	6
B	5	8	12
1	5	10	17
2	9	14	23

D. No more than 5.0 percent of the material furnished shall be less than the minimum size specified nor no more than 10.0 percent of the material shall exceed the maximum size specified.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. The Contractor shall prepare the subgrade such that the finished rip rap surface conforms to the lines, slopes and elevations indicated. The Contractor shall clear the subgrade of sticks, stones, debris and other materials that could puncture the overlying geotextile. The finished subgrade shall not vary from design grade by more than 2 inches at any location.

3.2 PLACEMENT OF GEOTEXTILE

A. The Contractor shall place geotextile material only on subgrade approved by the Engineer in accordance with the recommendations of the material manufacturer.

3.3 PLACEMENT OF RIP RAP

A. The Contractor shall proceed with placing the riprap immediately upon completion of geotextile installation.

B. Rip rap shall be placed on the surface of slopes and at storm drainage pipes at the locations indicated on the plans. Rip rap shall be placed to a minimum depth of 1.5 times the midrange stone size for the class of rip rap specified, but in no case less than 6 inches.

C. Rip rap shall be placed in such a manner as to produce a reasonably well-graded mass with the minimum practicable percentage of voids.

D. Place to full course thickness in one operation in a manner to avoid displacing or puncturing geotextile. Rip rap shall not be dropped from a height greater than one foot above the geotextile.

E. The Contractor may place the rip rap by mechanical methods, augmented by hand placing where necessary, provided that when the rip rap is completed it forms a uniformly graded, dense, neat layer of rip rap of the necessary depth.

F. Unless otherwise indicated or directed by the Engineer, the rip rap shall be placed upon a slope which shall be no steeper than the angle of repose.

END OF SECTION 312271

SECTION 321216 BITUMINOUS PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All work and materials required under this section of the specifications shall conform to the applicable sections of the latest edition of the North Carolina Department of Transportation Division of Highways Standard Specifications for Roads and Structures and the North Carolina Department of Transportation Pavement Construction Section Superpave Hot Mix Asphalt / Quality Management System.

1.2 SUMMARY

A. Section Includes:

1. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Asphalt surface treatments.
6. Pavement-marking paint.
7. Traffic-calming devices.

B. Related Sections:

1. Division 02 Sections "Demolition" and/or “Selective Demolition” for demolition, removal, and recycling of existing asphalt pavements.
2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
3. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.
4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
2. Job-Mix Designs: For each job mix proposed for the Work.

B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each paving fabric, 12 by 12 inches minimum.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each paving fabric, 12 by 12 inches minimum.
2. Each type and color of preformed traffic-calming device.
3. Each pattern and color of imprinted asphalt.

E. Material Certificates: For each paving material, from manufacturer.

F. Material Test Reports: For each paving material.

G. The Contractor shall furnish copies of certified weight tickets for all asphalt placed on the project. The original of all tickets, including any voided tickets or tickets for rejecting mixture, shall become the property of the Engineer.

1.5 QUALITY ASSURANCE

A. All aspects of the work, including, but limited to materials, equipment, application and installation procedures, quality control, and environmental conditions necessary for application/installation of materials shall be in accordance with the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

B. Quality control and quality assurance are provided for through use of the Quality Management System, as discussed in Section 1 of the latest edition

Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

C. All hot mix asphalt must be provided by a Certified Asphalt Plant, as covered in Section 5.3 of the latest edition Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

D. Asphalt plant equipment and operations shall meet the Specifications set forth in Section 5 and 6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

E. Delivery and Acceptance of Asphalt Materials must conform to Section 2.40.10 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

F. The Engineer reserves the right to sample and test any shipment and to reject any material not meeting the requirements of the specifications.

G. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the North Carolina Department of Transportation for all asphalt paving work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Transportation of Bituminous Mixture: Asphalt Mixtures shall be hauled in accordance with Section 6.9 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

B. Deliver paint and pavement-marking materials to Project site in original containers and packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

C. Store paint and pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply asphalt materials only when the environmental conditions for the specific material to be applied are in accordance with Section 9 of the latest edition of the Superpave Hot Mix

Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces in environmental conditions recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. All aggregates utilized in bituminous pavement mixtures shall be in accordance with Section 2.5 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section with the exception of paragraph 2.5.2.D.

2.2 ASPHALT MATERIALS

A. All asphalt materials utilized on the project shall be in accordance with the requirements of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

B. Water: Potable.

2.3 PAVEMENT MARKINGS

A. The following are minimum requirements and shall govern except all local, state and/or federal highway or transportation department standard specifications shall govern when their requirements are in excess thereof.

B. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type F, and colors complying with the latest revision of FS TT-P-1952.

1. Color: As indicated.

2.4 WHEEL STOPS

A. Wheel Stops: Precast, air-entrained concrete, 2,500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

2.5 PRE-FORMED TRAFFIC-CALMING DEVICES

A. Speed Bumps, Humps, and Cushions: Solid, integrally colored, 100 percent postconsumer or commingled postconsumer and postindustrial recycled **plastic**; UV stabilized. Provide holes for anchoring to substrate.

1. Size: Modular bumps 2 inches high by 10 inches wide by 72 inches long, with overall length as dimensioned on Drawings.
2. Size: Modular assemblies 4 inches high by 14 feet in overall width, with overall length as dimensioned on Drawings.
3. Mounting Hardware: Galvanized-steel hardware as standard with device manufacturer.
4. Adhesive: As recommended by device manufacturer.

2.6 COMPOSITION OF MIXTURES

A. The asphalt mix formula shall be in accordance with Section 4.6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

B. The job mix formula for each mixture will establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to the aggregate, and a single temperature at which the mixture is to be discharged from the plant and shall be within the design limits specified for the particular type of bituminous mixture.

C. The job mix formula for each mixture shall be in effect until modified in writing by the Engineer.

D. All mixtures furnished for the work shall conform to the job mix formula within the tolerance ranges specified for the particular mix involved as specified herein.

E. Should a change in sources of aggregate materials be made, a new job mix formula will be required before the new mixture is produced.

F. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.

G. Bituminous Base Course, Type B 25.0B: The bituminous base course mixture shall conform to Table 2 in Section 4.6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

H. Bituminous Intermediate Course, Type I 19.0B: The bituminous intermediate course mixture shall conform to Table 2 in Section 4.6 of the latest edition of the

Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

I. Bituminous Surface Course (SF 9.5A and S 9.5B): The bituminous surface course mixture shall conform to Table 2 in Section 4.6 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

J. Tack Coat: Tack Coat shall conform to Section 9.31 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction System.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation asphalt.

3.2 COLD MILLING

A. The equipment utilized in milling of existing asphalt pavements shall be in accordance with Section 8.7 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction System.

B. Additional equipment necessary to satisfactorily remove the pavement in the area of manholes, water valves, curb and gutter, and other obstructions shall be provided.

C. The pavement removal operations shall be conducted to effectively minimize the amount of dust being emitted in accordance with local, State, and Federal air pollution control laws and regulations. The operation shall be planned and conducted so that it is safe for persons and property adjacent to the work including the traveling public.

D. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

E. The existing pavement shall be milled in a manner which will restore the pavement surface to a uniform longitudinal profile and cross section at the locations and in accordance with typical sections shown on the plans. Where indicated in the plans, removal shall be to a specified depth and shall produce a specified cross slope.

F. The Contractor may elect to make multiple cuts to achieve the required depth of cut or cross slope required by the plans.

G. The longitudinal profile of the milled surface shall be established by a mobile string line on the side of the cut nearest the centerline of the road. The cross slope of the milled surface shall be established by an automatic cross slope control mechanism or by a second skid sensing device located on the outside edge of the cut. The Engineer may waive the requirement for automatic grade and cross slope controls where conditions warrant.

H. The milling equipment shall be operated in such a manner as to prevent damage to the underlying pavement structure, utilities, drainage facilities, curb and gutter, paved surfaces outside the milled area, and any other appurtenances. The milled pavement surface shall be reasonably smooth and free of excessive scarification marks or other damage as determined by the Engineer. Any leveling or patching required as a result of negligence by the Contractor shall be repaired with hot bituminous plant mix at no cost to the Owner and in a manner acceptable to the Engineer. The Contractor shall coordinate the adjustment of manholes, meter boxes and valves boxes with the milling operation.

I. The Engineer may require remilling any area where surface laminations or defects resulting from the Contractor's operations cause a non-uniform surface to occur.

J. The milled pavement surface shall be thoroughly cleaned of all loose aggregate particles, dust and other objectionable material by the use of power brooms, power blowers, power vacuums or other means.

3.3 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. The surface preparation necessary for asphalt patching shall be done in accordance with Section 3.5 below.

C. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

   1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

D. Tack Coat: Tack coat shall be applied in accordance with Section 9.3 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

E. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

F. Traffic Markings: The Contractor shall repair and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with the requirements described elsewhere in this section.

G. Existing Utilities: All existing manhole and valve covers shall be raised by the Contractor as necessary prior to paving so that the tops of the covers are flush with the final surface. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. Preparation of Subgrade: The work covered under this section of this specification shall be performed in strict accordance with Section 500 of the latest edition of the North Carolina Department of Transportation Division of Highways Standard Specifications for Roads and Structures.

B. Application of Aggregate Base Course: The work covered under this section of this specification shall be performed in strict accordance with Section 520 of the latest edition of the North Carolina Department of Transportation Division of Highways Standard Specifications for Roads and Structures.

C. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

D. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

E. Prime Coat: Prime coat shall be applied in accordance with Section 9.2 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

F. Tack Coat: The work covered under this section of this specification shall be performed in strict accordance with Section 605 of the latest edition of the North Carolina Department of Transportation Division of Highways Standard Specifications for Roads and Structures and Section 9.3 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

3.6 HOT-MIX ASPHALT PLACING

A. Asphalt Mixtures shall be hauled in accordance with Section 6.9 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System.

B. Bituminous Plant Mix - General: The work covered under this section of this specification shall be performed in strict accordance with Section 610 and Section 620 of the latest edition of the North Carolina Department of Transportation Division of Highways Standard Specifications for Roads and Structures and Sections 2 through 6 and Section 9 of the Superpave Hot Mix Asphalt / Quality Management System of the North Carolina Department of Transportation Pavement Construction Section. For pavement repairs, see Section 654 of the latest edition of the North Carolina Department of Transportation Division of Highways Standard Specifications for Roads and Structures.

C. Base Course, Type B 25.0B); Intermediate Course (I 19.0B); Surface Courses (SF 9.5A and S 9.5B): All hot mix placement and compaction operations shall conform to Section 9.4 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

D. Spreading and Finishing: Spreading and finishing of asphalt pavements shall be done in accordance with Section 9.5 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

E. Compaction: Compaction of asphalt pavements shall be done in accordance with Section 9.7 of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

F. Joints:

1. Transverse Joints: Transverse joints are to be constructed in accordance with Section 9.9 of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

2. Longitudinal Joints: Longitudinal are to be constructed in accordance with Section 9.10 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

G. Weather and Seasonal Limitations: Placement of asphalt is limited in accordance with Section 9.4.3 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

3.7 ASPHALT CURBS

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 degrees F.

1. Asphalt Mix: Same as pavement surface-course mix.

B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.8 ASPHALT TRAFFIC-CALMING DEVICES

A. Construct hot-mix asphalt speed bumps, humps, cushions, and tables over compacted pavement surfaces. Apply a tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 degrees F.

1. Tack Coat Application: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
2. Asphalt Mix: Same as pavement surface-course mix.
3. Before installation, mill pavement that will be in contact with bottom of traffic-calming device. Mill to a depth of 1 inch from top of pavement to a clean, rough profile.

B. Place hot-mix asphalt to cross section indicated, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.9 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.

B. Paint shall only be applied when the atmospheric, surface, and material conditions are in accordance with the manufacturer's requirements.

C. Contractor must insure that pavement surface to be painted shall be clean and dry before application. All surface contamination such as oil, grease, dirt, foreign matter, or other deleterious materials will be removed by the Contractor prior to application of paint.

D. Paint shall be applied with mechanical equipment to produce uniform straight edges in strict compliance with the manufacturer's instructions. Paint shall be applied in two (2) coats at the manufacturer's recommended rates.

3.10 WHEEL STOPS

A. Install wheel stops in bed of adhesive as recommended by manufacturer.

B. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 PRE-FORMED TRAFFIC-CALMING DEVICES

A. Install pre-formed speed bumps, humps, and/or cushions in bed of adhesive as recommended by manufacturer for heavy traffic.

B. Securely attach preformed speed bumps, humps, and/or cushions to pavement with hardware spaced as recommended by manufacturer for heavy traffic. Recess head of hardware beneath top surface.

3.12 FIELD QUALITY CONTROL

A. The Owner will engage a qualified testing agency to perform tests and inspections and shall bear the responsibility for paying all costs associated with passing tests. The Contractor shall bear all costs in making all necessary repairs to make work satisfactory after a failed test and shall pay all costs associated with failed tests.

B. Sampling and testing shall be in accordance with Section 7 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

C. Mat cross-slope and thickness shall be tested according to Section 10.1.8 of the latest edition of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section.

D. Surface texture shall conform to Section 10.1.9 of the Superpave Hot Mix Asphalt/Quality Management System of the North Carolina Department of Transportation Pavement Construction Section. Smoothness shall conform to Section 10.2. Areas found to reveal non-conformance corrected by the Contractor by removal of the defective work and replacement with new material unless other corrective measures are permitted by the Engineer. The work and

materials required in the correction of defective work shall be provided by the Contractor at no cost.

E. The Contractor shall repaint and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

F. All existing manhole and valve covers shall be raised by the Contractor as necessary prior to paving so that the tops of the covers are flush with the final surface. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

G. Replace and compact hot-mix asphalt where core tests were taken.

H. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. The milled material shall become the property of the Contractor. All milled material shall be disposed of by the Contractor in an EPA-approved landfill, except where the milled material is used in the work or recycled. Do not allow milled materials to accumulate on-site.

END OF SECTION 321216

SECTION 322905 RESTORATION OF SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section covers the furnishing of all labor, equipment and materials necessary for the proper restoration of existing surfaces disturbed or damaged as a result of construction operations which are not specifically scheduled or specified for topsoil and seeding, paving, landscaping or other surfacing.

B. In general, the types of replacement included in this section are seeding along pipelines, concrete sidewalks, driveways, roadways, ditches, lawns and landscaped areas, and curb and gutter.

C. Any damage to existing structures shall be repaired using materials and workmanship equal to, or better than, those of the original construction.

1.3 DEFINITIONS

A. CABC – Crushed aggregate base course.

B. NCDOT – North Carolina Department of Transportation.

C. PSI – Pounds per square inch.

1.4 SUBMITTALS

A. All submittals shall be in accordance with the requirements of the pertinent specification sections referenced herein.

B. An appropriate concrete mix design shall be submitted for all concrete sidewalks, driveways, roadways, and curb and gutter restored as part of this project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SEEDING DISTURBED AREAS

A. All ground surfaces disturbed by construction activity, which are not classified as lawns, landscaped areas, or pavement areas, but would be classified as open fields, shall be raked smooth and seeded in accordance with the appropriate paragraph(s) within Section 329200 entitled Turf and Grasses. Large rocks, clumps of earth and excessive spoil material shall be removed from the area prior to seeding.

B. Shoulders of all roads shall be restored as specified for lawns and landscaped areas.

C. Wooded areas not classified as lawns shall be restored to as near their original condition as possible.

3.2 CONCRETE SIDEWALKS

A. Concrete walks removed in connection with, or damaged as a result of, construction operations under the Contract shall be replaced with new construction. Such walks shall be constructed of 4,000 PSI concrete on a thoroughly compacted subgrade, shall have a vertical thickness, unless otherwise noted, of not less than 4 inches or the thickness of the replaced walk where greater than 4 inches.

B. Walks shall be float finished, edged with an edging tool, and grooved at intermediate intervals not in excess of the width of the walk, uniform throughout the length of the walk in any one direction.

3.3 DRIVEWAYS

A. Unless otherwise noted, unpaved driveways shall be surfaced with not less than 4 inches of CABC, topped with 4 inches of stone, gravel, or other materials equal to that found in the original driveway. Driveways shall be left in a condition better than their original condition.

B. Concrete drives shall be replaced with 4,000 PSI concrete and shall have equal thickness and reinforcing steel to that of the original drive. Prior to placing the concrete a 6-inch aggregate base course shall be placed in the drive area.

C. Unless otherwise noted, bituminous or asphaltic concrete drives shall be restored to original base and asphalt thicknesses or a minimum of 6 inches of

aggregate base course and a 2-inch surface course, whichever is greater. Base material shall be compacted in 3-inch lifts and Type SF 9.5A or S 9.5B asphalt compacted in 2-inch lifts to match existing pavement section. All work shall be in accordance with the appropriate paragraph(s) of Section 321216 entitled Bituminous Paving.

3.4 ROADWAY REPLACEMENT

A. Bituminous or Asphaltic pavements shall include all areas paved with blacktop, built up pavements or oil and stone, tar and stone and similar pavements constructed with a bituminous or asphalt and stone materials.

B. Immediately upon completion of installation of underground piping and structures, the trench shall be backfilled and the roadway shall be repaired. Provide materials as specified in the Contract Drawings. If, in the opinion of the Engineer, the area adjacent to the excavation has not been damaged to the extent that the base course need to be replaced, restoration may consist of a surface course of sufficient thickness to meet the existing pavement.

C. Unless otherwise noted, bituminous or asphaltic concrete roadways shall be restored to original base and asphalt thicknesses or a minimum of 6 inches of aggregate base course and a 2-inch surface course, whichever is greater. Base material shall be compacted in 3-inch lifts and Type SF 9.5A or S 9.5B asphalt compacted in 2-inch lifts to match existing pavement section. All work shall be in accordance with the appropriate paragraph(s) of Section 321216 entitled Bituminous Paving.

D. Portland cement concrete roadways shall be replaced with 4,000 PSI concrete and shall have equal thickness and reinforcing steel as the original roadway. An aggregate base course with a thickness of 6 inches shall be placed prior to the placing of concrete.

E. Differential settlement of restored pavements shall be corrected immediately.

F. The Contractor shall repair and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications.

G. All existing manhole and valve covers shall be raised, as required, by the Contractor prior to paving. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

3.5 DITCHES

A. Ditches shall be regraded to the original grade and line. The surface of all ditches shall be returned to the same condition as found before commencing work.

3.6 LAWNS AND LANDSCAPED AREAS

A. Lawns and landscaped areas shall be regraded and replaced as follows:

1. Grading shall be to the grade existing before construction of the work under this Contract.
2. Lawn replacement shall be in accordance with the appropriate paragraph(s) within Section 329200 entitled Turf and Grasses. Topsoiled areas shall be replaced with topsoil of equal quality and quantity.

B. Landscaped areas shall be replaced with shrubs, hedges, ornamental trees, flowers, or other items to original condition.

3.7 CURB AND GUTTER

A. Curb and gutter removed with or damaged as a result of construction operations, injured or disturbed by the Contractor, his agents, or employees, shall be replaced with new construction to a condition similar and equal to that existing before damage was incurred. 4,000 PSI concrete shall be used in curb and gutter replacement.

B. All work associated with curb and gutter replacement shall be in accordance with Section 846-3 of the NCDOT Standard Specifications for Roads and Structures (latest edition). Horizontal and vertical alignment of the curb and gutter shall match that of the existing to the greatest extent practical, unless directed otherwise by the Engineer.

3.8 DAMAGE TO STRUCTURES

A. Any damage to existing structures shall be repaired of materials and workmanship equal to those of original construction. Extensively damaged structures, where the structural stability has been affected or which cannot be repaired in a suitable fashion shall be replaced entirely. Replacement shall not commence until approval of the plan of replacement has been given by the Engineer. Replacement costs shall be responsibility of the Contractor.

END OF SECTION 322905

SECTION 323113 CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Swing gates.

1.3 PERFORMANCE REQUIREMENTS

A. System Description: Unless otherwise indicated on the plans, all fencing will have a nominal height (as shown on drawings), using 2-inch, 9 gauge woven wire mesh fabric, green vinyl coated. The fencing will be supported by posts and a top rail as shown on the drawings. The design and dimension of the fence components shall be as shown on the drawings and as specified herein.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, reinforcements, and attachments.
3. Gates and hardware.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

C. Product Certificates: For each type of chain-link fence, and gate, from manufacturer.

D. Product Test Reports: For framing strength according to ASTM F 1043.

E. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:

1. Gate hardware.

F. Warranty: Sample of warranty.

1.5 QUALITY ASSURANCE

A. The manufacturer shall be reputable and shall be experienced in the manufacture of chain link fencing.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.7 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations, and shall be properly protected.

1.8 WARRANTY

A. All material shall be warranted to be free from defects in workmanship and design for a period of one (1) year from the date of acceptance by the Owner.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire Fabric: Wire with a diameter of 0.148 inch.

    a. Mesh Size: 2 inches.
    b. Green vinyl coating.

3. Selvage: Twisted top and knuckled bottom.

2.2 FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:

1. Fence Height: As indicated on Drawings.
2. Heavy Industrial Strength: Material Group IA, round steel pipe, Schedule 40

    a. Line Post: 2.375 inches in diameter.
    b. End, Corner and Pull Post: 2.875 inches.

3. Horizontal Framework Members: Top rails complying with ASTM F 1043.

    a. Top Rail: 1.66 inches in diameter.

4. Green vinyl coating for Steel Framing

2.3 TENSION WIRE

A. Green vinyl coated Steel Wire: 0.177-inch diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, matching chain link fabric coating weight.

2.4 FITTINGS

A. General: Comply with ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Barbed Wire Arms: Pressed steel with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts; for each post unless otherwise indicated, and as follows:

1. Provide line posts with arms that accommodate top rail or tension wire.
2. Provide corner arms at fence corner posts, unless extended posts are indicated.
3. Type I, single slanted arm.

I. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:

a. Hot-Dip Galvanized Steel: 0.148-inch diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

J. Finish:

1. Black vinyl coating.

2.5 SWING GATES

A. General: Comply with ASTM F 900 for gate posts and single and/or double swing gate types.

1. Gate Leaf Width: As indicated.
2. Gate Fabric Height: As indicated.

B. Pipe and Tubing:

1. Green vinyl Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framing.
2. Gate Posts: Round tubular steel.
3. Unless otherwise required by ASTM F 900, as a minimum, posts for swing gates shall be sized according to the following gate leaf widths:

		lb. per lin. ft.
Up to 6'	3-1/3" x 3-1/2" roll formed section or 2-7\8" OD Pipe	5.14 5.79
Over 6' to 13'	4" OD Pipe	9.11
Over 13' to 18'	6-5/8" OD Pipe	18.97
Over 18'	8-5/8" OD Pipe	24.70

4. Gate Frames and Bracing: Gate frame members shall be 1.90” OD round tubular steel and have 3/8-inch diameter adjustable truss rods.

C. Frame Corner Construction: Welded.

D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame 12 inches to attach barbed wire assemblies.

E. Hardware:

1. Hinges: 360-degree inward and outward swing.
2. Latches permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Padlock and Chain: Owner furnished.
4. Drive gates shall have a center plunger rod, catch, and semi-automatic outer catch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Engineer.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, sprinkler systems, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

1. Install fencing in location shown on the Drawings.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in a foundation of 3,000 psi concrete at indicated spacing into firm, undisturbed soil. Concrete foundation shall have a minimum diameter 9 inches or three times the diameter of the post and shall be at least 36 inches deep.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts evenly at 10 feet or less apart true to line.

E. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches on center. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along bottom of fence fabric. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

G. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on center.

I. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

   1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to braces at 24 inches on center.

J. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION 323113

SECTION 329200 TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section covers the furnishing of all labor, equipment and materials necessary for the establishment of vegetation in all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses or legumes.

1.3 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified

with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Evidence of State certification of each seed mixture for turfgrass sod and plugs. Include identification of nursery source and name and telephone number of supplier.

B. Product Certificates: For soil amendments and fertilizers, from manufacturer.

C. Certificates of Inspection as required by law or governing authorities to accompany shipments.

D. Source of mulch for approval and five (5) gallon bucketful physical sample.

E. Proposed planting schedule, indicating dates for all work during normal seasons for such work. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and grasses during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

A. No material substitutions will be permitted without the prior written approval of the Engineer.

B. All materials shall be applied in strict accordance with manufacturer's written instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Products shall be packed and shipped in a manner which will not damage them.

B. Damaged products shall be rejected upon delivery and promptly removed from the site.

C. Products which must be stored prior to installation shall be protected from damage and theft.

D. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents, or other causes.

E. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

A. Schedule and coordinate work with all trades involved.

B. Verify that the areas of work have been properly contoured and brought to final grade prior to beginning work.

C. Consult record drawings and installers to determine actual underground utility and drainage system locations in the vicinity of this work. Damage to known or unrecorded utilities will be repaired at the Contractor's expense.

D. Notify the Engineer of any unforeseen conditions which will affect plant installation or growth.

E. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Optimum Spring Planting: April 1 – May 1.
2. Optimum Fall Planting: September 1 – October 1.

F. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until Final Acceptance of the project by the Owner.

B. Initial Meadow Maintenance Service: Provide full maintenance by skilled employees. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until Final Acceptance of the project by the Owner.

C. Continuing Maintenance Requirements: Throughout the warranty period of the Work, excluding conditions of vandalism, theft, accident, acts of God and Owner's negligent maintenance, Contractor shall be responsible for making any and all necessary repairs to planted areas which may include or may result from, the lack of fully established growth of turfs and grasses and/or soil erosion from project areas. In such instances, Contractor shall be responsible for restoring these areas to originally accepted conditions as well as full establishment of turfs and grasses or other groundcovers in the area. The Contractor shall also be responsible for any damages to adjacent areas impacted by the lack of proper turf and grass establishment.

PART 2 - PRODUCTS

2.1 FERTILIZERS

A. The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.

B. For all areas to be seeded which are not classified as lawns, but would be classified as open fields, fertilizer shall be free-flowing, ready mixed 10-10-10 grade commercial fertilizer. Upon written approval of the Engineer a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.

C. For all areas to be seeded which are classified as lawns, fertilizer shall be as follows:

1. Fertilizer tablets: Agriform Planting Tablets 20-10-5 as manufactured by Scotts-Sierra Horticultural Products, or equal, may be used at installer's option.
2. Encapsulated fertilizer: Osmocote 19-6-12 as manufactured by Scotts-Miracle Gro, or equal, may be used at installer's option.

D. During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

2.2 LIME

A. Lime: The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
2. Provide lime in the form of free-flowing ground dolomitic limestone.

B. During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original condition before being used.

2.3 SEED

A. Grass seed shall be fresh, clean, dry, new-crop seed complying with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture.

B. Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Engineer before being sown, and no seed will be accepted with a date of test more than nine (9) months prior to the date of sowing. Such testing however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.

C. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents, or other causes.

D. Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.

E. Seed Purity: All seed species shall consist of seed with not less than a 95 percent germination rate, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

2.4 MULCH

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, threshed straw of wheat, rye, or oats which is free of noxious weeds or other species which would grow and be detrimental to the specified grass.

B. Wood Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 10 percent (±2 percent); organic matter 99.4 percent (±0.2 percent); ash content 0.6 percent (±0.2 percent) water holding capacity of 1050 grams water/100 grams dry fiber. and a pH range of 4.5 to 6.5.

2.5 TACIFIER

A. Tackifier shall consist of an asphalt emulsion in accordance with ASTM D 977, Grade SS-1; shall be nontoxic and free of plant-growth or germination inhibitors.

2.6 WATER

A. Water shall be clean, clear water free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the Contractor.

2.7 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface. Include manufacturer's recommended anchorage system for slope conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Engineer and replace with new planting soil.

3.2 PROTECTION OF EXISTING STRUCTURES, UTILITIES, TREES AND VEGETATION

A. Protect existing structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, and smothering of trees by stockpiling construction materials or excavated materials, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide wood or metal stakes 48 inches in height, set on eight (8) to 10 foot centers, connected by 2-inch minimum brightly colored flagging tape or fabric fencing to protect trees and vegetation to remain. Set perimeter of protection at the drip line of trees to remain unless approved otherwise by the Engineer.

B. Provide protection for roots over 1-1/2 inch in diameter cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable

coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.

C. The Contractor shall not remove or damage trees and shrubs which are outside the Clearing Limits established by the Owner or those within the Clearing Limits designated to remain.

D. Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Engineer. Repair damaged trees promptly to prevent progressive deterioration caused by damage.

E. Replace trees scheduled to remain and damaged beyond repair by construction operations, as determined by the Engineer, with trees of similar size and species. Repair and replacement of trees scheduled to remain and damaged by construction operations or lack of adequate protection during construction operations shall be at the Contractor's expense.

F. Protect adjacent and adjoining areas from hydroseeding, hydromulching, and tackifier overspray.

G. Protect grade stakes set by others until directed to remove them.

3.3 GRADING

A. Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.

B. Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction materials. It shall also include thorough loosening of the soil to a depth of 6” by plowing, discing, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of landscaping shall be performed on a section by section basis immediately upon completion of earthwork.

C. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Engineer may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Engineer.

3.4 SECURING AND PLACING TOPSOIL

A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by the Engineer.

B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed the product, will be homogeneous in nature and will conform to the requirements of these specifications.

C. .All areas ·from which topsoil is to be secured, shall be cleaned of all sticks, boards, stones, lime, cement, ashes, cinders, slag, concrete, bitumen or its residue and any other effuse which will hinder or prevent growth.

D. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the Engineer, the pit shall be abandoned.

E. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed, unless otherwise approved by the Engineer. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil· for use.

F. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.5 SEEDBED PREPARATION

A. The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside of the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Engineer to provide for more effective seeding and for ease of subsequent mowing operations.

B. The soil shall then be scarified or otherwise loosened to a depth of not less than 6 inches except as otherwise provided below or otherwise directed by the Engineer. Clods shall be broken and the top 2 to 3 inches of soil shall be worked into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other methods approved by the Engineer.

C. On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Engineer.

D. On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Engineer, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.

E. On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in a condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.

F. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Engineer determines that it is in an otherwise unfavorable working condition.

G. Limestone may be applied at the rate described below as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be applied as described below.

3.6 APPLICATION OF LIMESTONE, FERTILIZER, SEED, AND MULCH (GENERAL)

A. Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Engineer before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

B. Limestone, fertilizer, seed and mulch shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Engineer determines that weather and soil conditions are unfavorable for such operations.

3.7 FERTILIZATION AND LIMING

A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates shown below. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of ½ inch.

B. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.

C. Agricultural limestone shall be thoroughly mixed into the soil according to the rates indicated below. The specified rate of limestone application may be reduced by the Engineer if pH tests indicate this to be desirable. It is the responsibility of the Contractor to obtain such tests and submit the results to the Engineer for adjustment in rates.

D. In the absence of a soil test, the following rates of application of fertilizer and lime shall be to all areas to be seeded which are not classified as lawns, but would be classified as open fields:

1. Lime: 4,000 pounds per acre
2. Fertilizer: 1,000 pounds per acre

E. For all areas to be seeded which are classified as lawns, fertilizer and lime shall be applied at the following rates:

1. Lime: 92 pounds per 1,000 square feet
2. Fertilizer: 23 pounds per 1,000 square feet

F. When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer <u>may</u> direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compacting the seedbed. Such modifications may include but not be limited to the following:

1. The incorporation of limestone into the seedbed may be omitted on:

   a. Cut slopes steeper than 2:1;
   b. On 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or
   c. on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.

G. It shall be the responsibility of the Contractor to make an additional application of maintenance fertilizer in the amount of 650 pounds per acre (15 pounds per 1,000 square feet) following the initial establishment of groundcover. This application shall occur when vegetation is three (3) inches in height or 45 days after initial seeding, whichever comes first.

3.8 SEEDING

A. Seeding shall commence as soon as preparation of the seedbed has been completed. Do not broadcast or drop seed when wind velocity exceeds 5 mph or until the surface is suitable for working and is in proper condition. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.

B. All disturbed areas shall be seeded unless specifically indicated to receive other types of plantings or groundcovers.

C. Seed may be uniformly sown over the seedbed by a mechanical method suitable for the slopes and size of the areas to be seeded. Broadcast type seeders, windmill hand seeder or approved mechanical power drawn seed drills may be utilized.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Do not seed against existing trees.

D. For all areas to be seeded which are not classified as lawns, but would be classified as open fields, seed species and application rates shall be as follows:

1. Spring/Summer (Normally April 1 to August 31):

   a. 100 pounds of Ky-31 tall fescue per acre.

2. Fall and Winter (Normally September 1 to March 31):

   a. 85 pounds of Ky-31 tall fescue and 15 pounds of rye grain per acre.

3. On cut and fill slopes having 2:1 or steeper slopes, add 15 pounds of sudangrass to the planned seeding in summer seeding or 25 pounds of rye cereal per acre in fall and winter seeding, if seeded September to February.
4. These seeding rates are prescribed for all sites with less than 50 percent ground cover and for sites with more than 50 percent ground cover where complete seeding is necessary to establish effective erosion control vegetative cover. On sites having 50 to 80 percent ground cover where complete seeding is not necessary to establish vegetative cover, reduce the seeding rate at least one-half the normal rate.

E. For all areas to be seeded which are classified as lawns, seed species and application rates shall be as follows:

1. "Rebel" turftype fescue.....3 pounds per 1,000 square feet
2. "Falcon" turftype fescue .....3 pounds per 1,000 square feet

Total Mix .....6 pounds per 1,000 square feet

F. Care shall be taken to adjust the seeder for seeding at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in the mixture.

G. Immediately after application, harrow, drag, rake, or otherwise work seedbed so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Engineer. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

H. When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of cover, the seed requiring the lighter cover may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

1. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.
2. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

I. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.

3.9 MULCHING

A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied so as to permit some sunlight to penetrate and the air to circulate and at the same time, shade the grounds, reduce erosion and conserve soil moisture. Approximately 25 percent of the ground shall be visible through the mulch blanket.

B. To achieve the coverage described above, it will be necessary to apply straw mulch to seeded areas at a rate of approximately 4,000 pounds per acre (92 pounds per 1,000 square feet) or wood fiber mulch at a rate of 1,600 pounds per acre (37 pounds per 1,000 square feet).

C. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application as described above.

D. Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3 inches in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil.

E. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.

F. The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

3.10 TACIFIER

A. Emulsified asphalt or organic tackifier shall be sprayed uniformly on mulch as it is ejected from blower or immediately thereafter. Tackifier shall be applied evenly over area creating uniform appearance. Application rates and method of application will vary with conditions, be approved by the Engineer, and shall be applied in sufficient amount to assure that the mulch is properly held in place. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch operation.

B. The Contractor shall cover/protect structures, poles, fences and other appurtenances if mulch binder is applied in such a way that it may come in contact with or discolor those structures or appurtenances. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates in a manner acceptable to the Engineer.

C. Asphalt shall not be used in freezing weather.

3.11 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseeding applications. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch tackifier in accordance with manufacturer's recommendations.
2. Fiber mulch shall be mixed into the slurry such that the application rate of the fiber mulch is 1,500 to 2,000 pounds per acre.
3. Apply slurry uniformly to all areas to be seeded in a one-step process in accordance with the application rates described herein.

B. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Engineer.

3.12 EROSION CONTROL MATERIALS

A. Install all erosion control materials in accordance with manufacturer's recommendations and as shown on Drawings.

3.13 TURF RENOVATION

A. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

   1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
   2. Install new planting soil as required.

B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

C. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

D. Mow, dethatch, core aerate, and rake existing turf.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

H. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.

I. Apply seed and protect with straw mulch as required for new turf.

J. Water newly planted areas and keep moist until new turf is established.

3.14 TURF MAINTENANCE

A. The Contractor shall keep all seeded areas in good condition, reseeding and mowing if and when necessary as directed by the Engineer, until a good lawn is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.

B. Grassed areas will be accepted when a 95 percent cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.

C. Areas of damage or failure due to any cause shall be corrected by repair or by being completely redone as may be directed by the Engineer. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications shall be repaired by the Contractor as directed by the Engineer at no cost to the Owner.

3.15 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

333400.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, and equipment necessary to complete the Landfill Gas and Leachate Collection Piping (LFG&LCP) System including trench excavation, hauling, spreading, grading, rolling and all necessary and incidental items required to complete the Work, all in accordance with the Contract Drawings and these Contract Specifications.

333400.2 Handling and Storing Materials

The Contractor shall unload material so as to avoid deformation or other injury thereto. Material shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the appurtenances on sills above storm drainage level and deliver for installation after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner and at his own expense.

333400.3 Submittals

Submit manufacturer's product data indicating pipe properties, pipe accessories, sizes, etc., and required certifications and warranties.

Scale drawings showing welding and fabrication details for concentric piping connections, fittings, and outlets, etc.

333400.4 Certification

The pipe supplier shall submit certification that the pipe and fittings meet the specifications.

333400.5 Materials

Pipe and fittings for the LFG&LCP System shall be High Density Polyethylene (HDPE) pipe.

1. HDPE piping shall have nominal diameters as noted on the Contract Drawings.
2. Landfill Gas and Leachate Collection HDPE piping shall have a maximum Standard Dimension Ratio (SDR) of 17 or as specified on the Contract Drawings.
3. Terrace/ Ditch Toe Drain HDPE Piping shall have a Standard Dimension Ratio (SDR) of 21 or as specified on the drawings.
4. Pipe shall be manufactured to meet the requirements of ASTM D2513.
5. The HDPE pipe to be perforated shall be as follows or approved by the Engineer:
    a. Four rows of perforations; Two rows on each side of pipe at approximately 45° and between 75° and 90° from bottom of pipe.
    b. Each row of perforations shall have holes approximately 6 inches on center; and
    c. Each hole shall be 1/2-inch diameter.
6. Fittings shall be molded or fabricated from the same material as the pipe and shall be supplied by the same manufacturer as the pipe.
7. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects.
8. The chemical resistance of the HDPE pipe and all fittings shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources.
9. The HDPE pipe shall be manufactured from first quality virgin polyethylene with the following nominal properties:

Property	**ASTM Method**	**Frequency**	**Acceptable Value**
Material Designation			PE3608
Cell Classification	D3350	Per Shipment	345464C
Relative Density	D1505	Per Shipment	.95 gms/cm^3
Melt Index	D1238	Per Shipment	0.08 gms/10 min.
Carbon Black Content	D3350	Per Shipment	Min. 2%
Tensile Strength @ Yield	D638, Type IV	Per Shipment	3200 psi
Elastic Modulus	D638	Per Shipment	> 150,000 psi

333400.6 Flanged Connections

Flange adapters shall be used to connect the HDPE pipe to valves and other appurtenances (knockout pots, pump station, flare station etc.) where shown on the Contract Drawings. Flange adapters shall be the same SDR and from the same resin as the HDPE pipe. A ductile iron backup ring matching the bolt pattern of the valve or appurtenance will be used with each flanged connection. Bolts shall be tightened in a "star pattern" to recommended torque values. Bolts must be tightened a second time after 24 hours to insure a positive seal. Gaskets may be required per appurtenance manufacturer's recommendation.

333400.7 Certification

The pipe supplier shall submit certification that the pipe and fittings meet the specifications.

333400.8 Construction

Only two methods shall be utilized to join HDPE pipe: heat fusion and mechanical joining:

1. Heat fusion joints shall be used for all HDPE pipe and shall be made in accordance with pipe manufacturer's recommendations. Fusion equipment and a trained operator shall be provided by the Contractor. Pipe fusion equipment shall be of the size and nature to adequately weld all pipe sizes and fittings necessary to complete the project. Heat fusion shall be performed outside of the trench whenever practical. Before heat fusing pipe, each length shall be inspected for damage and for the presence of dirt, sand, mud, shavings, and other debris. Any foreign matter shall be completely removed. At the end of each day, all open ends of fused pipe shall be capped or otherwise covered to prevent entry by animals or other debris.

2. Branch saddle fusions shall be made in accordance with the pipe manufacturer's recommendations. Branch saddle fusion equipment shall be of the size to facilitate saddle fusion within the trench. For such operations, a bell hole shall be excavated of sufficient size to ensure an adequate and safe work area and in no case shall be less than required by applicable OSHA Standards.

3. No fusion shall be performed in the rain or other adverse conditions.

4. Mechanical joining shall be accomplished with HDPE flange adapters, neoprene gaskets (where required), and ductile iron back-up flanges, and shall be used only for connection to valves and other appurtenances as shown on the Contract Drawings.

5. Lengths of pipe to be handled as one section shall not exceed 300 feet unless approved by the Engineer.

6. Pipe Handling: HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for the type, grade, and SDR and in no case less than 40 pipe diameters.

333400.9 <u>Installation</u>

The layout of the landfill gas and leachate collection piping system shall be as shown on the Contract Drawings.

The Contractor shall do all field layout work for lines and grades from the information shown on the Contract Drawings or as furnished by the Engineer.

The pipe foundation shall be prepared to be uniformly firm and the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the drawings. Under no circumstances shall pipe be laid in water, on rock, or when trench conditions or weather is unsuitable for such work.

Should any landfill waste be encountered during excavation, it will be removed and hauled to the designated disposal area within the Francis Farm Landfill or hauled to the White Oak MSW Landfill for disposal. In no case will excavated waste be placed on the surrounding ground.

The Contractor shall remove all water which may be encountered or which may accumulate in the excavation by pumping or bailing and no structure shall be set until the water has been removed from the excavation. Any leachate encountered will be pumped directly to the leachate collection system or to a holding tank for later disposal in the leachate collection system. In no case will leachate be allowed to accumulate on the surrounding soil area.

In all cases, pipe is to be installed in strict accordance with the manufacturer's recommendations and the material specifications. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, damaged or displaced in the process of laying same, or of backfilling the trench.

During times when pipe laying is not in progress, the open ends of pipe shall be closed and no trench water or other material shall be permitted to enter the pipe.

All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95 percent of the Standard Proctor Test for the various types of backfill materials.

Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill materials shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer. Select material shall be defined as a finely graded material free from stones over 1/2 inch in diameter, plastic clays, organic material, frozen lumps and various debris and shall be approved by the Engineer prior to its installation.

Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

333400.10 Line Cleaning

Prior to testing of any section(s) of the landfill gas and leachate collection piping system, the Contractor shall completely clean the lines of all debris, silt, etc. The pipe shall be proved to be ready for use by the Owner and shall be proved to be in first class condition and constructed in accordance with the drawings and specifications.

The Contractor shall maintain the project, insofar as his construction work is concerned, in first class condition for such time as is necessary to satisfy the Engineer that all installations are correct and acceptable.

333400.11 Testing

All HDPE pipes shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The Contractor shall be responsible for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.

Like sizes of HDPE piping shall be fusion welded together into testing segments not to exceed 500 feet unless approved by the Engineer. Segments shall be connected to a testing apparatus on one end and fitted with caps on all openings.

The segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.

Tests shall be performed during periods when the pipe segments will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will reduce the pressure changes that will occur due to temperature fluctuations.

The test pressure shall be 5 psig (168 inches, w.c.) and the Contractor shall use a digital pressure gauge.

Pressure drop during the test shall not exceed one percent of the testing gauge pressure over a period of one (1) hour. This pressure drop shall be corrected for temperature changes before determining pass or failure. The Engineer shall sign off on the test form to indicate test compliance.

The Engineer shall be notified at least 24 hours prior to commencement of the testing procedure and shall be present during the test.

Equipment for this testing procedure shall be furnished by the Contractor. This shall consist of a polyethylene flange adapter with a blind flange. Tapped and threaded into the blind flange will be a temperature gauge (0 to 100 degrees C); a schraeder type air valve to facilitate pressurization with an air compressor hose; a ball valve to release pressure upon completion of the test; and a pressure measuring device. The pressure measuring device shall be a digital manometer capable of measuring positive or differential pressures of air and other non-corrosive gases over a range of 0 to 199.9 in-w.c.

Once any leaks are located and repaired, a retest of the line segment shall be performed.

333400.12 Measurement and Payment

See Section 01700.

END OF SECTION

SECTION 333405 LANDFILL GAS BUTTERFLY HEADER ISOLATION VALVES

333405.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, and equipment necessary to install, complete and ready to use, the Landfill Gas Butterfly Header Isolation Valves including excavation, hauling, spreading, grading, rolling and all necessary and incidental items required to complete the Work, all in accordance with the Contract Drawings and these Contract Specifications.

333405.2 HANDLING AND STORING MATERIALS

The Contractor shall unload valves and appurtenances so as to avoid deformation or other injury thereto. Valves and appurtenances shall not be rolled or dragged over the ground, gravel or rock during handling. The Contractor shall store the valves and appurtenances on sills above storm drainage level and deliver for installation after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used or, if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

If any defective material is discovered after installation, it shall be removed and replaced with sound material or shall be repaired by the Contractor in an approved manner and at his own expense.

333405.3 Submittals

Submit manufacturer's certificates of compliance on materials furnished, product data, manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, operation, and repair of each type of valve furnished. Submittal information shall also include applicable warranties.

333405.4 Certification

The valve supplier shall submit certification that the valves and appurtenances meet the specifications.

333405.5 Materials

U-PVC – Conforming to ASTM D1784 Cell Classification 12454A
PP – Polypropylene conforming to ASTM D4101 Cell Classification PP0210B67272
Nitrile - Nitrile Butadiene Rubber
SS – Stainless Steel

333405.6 Valves:

Butterfly valves less than 16” diameter shall be bubble tight, wafer design with a PVC body, PP disc and Nitrile seat and seals. Butterfly valves 16” diameter and larger shall be bubble tight, wafer design with a PVC or PP body, PP disc and Nitrile seat and seals. The liner shall be full seat design, fully molded around the body where only the disc and seat are wetted parts and features raised convex rings on the face to be utilized as the mating flange gaskets. Valve shall have a spherical disc design. Valves shall accept flat faced flanges in accordance with ANSI B16.5 bolt pattern for 150 lb flanges. Valve stem shall be either 316 SS (sizes 1-1/2” – 12”), or 403 SS (Sizes 14” – 24”), be non-wetted, and have engagement over the full length of the disc. Valves shall feature a molded ISO bolt pattern for accessory mounting.

Valves shall have a minimum pressure rating of:

150 psi @ 70° F sizes 1-1/2” – 10”
100 psi @ 70° F sizes 12” – 14”
85 psi @ 70° F sizes 16”
75 psi @ 70° F sizes 18” – 24”

333405.7 Operators:

Lever Type – Standard sizes – 1-1/2” to less than 8” butterfly valves unless otherwise shown on the Contract Drawings or specified in the Contract Documents.

Gear Type – Standard – 8” -16” butterfly valves unless otherwise shown on the Contract Drawings or specified in the Contract Documents.

Gear Type – Standard – 18” – 24” butterfly valves.

333405.8 Stem Extensions:

Stem extensions, where shown on the Contract Drawings or otherwise specified in the Contract Documents, shall be designed, built and provided by the same manufacturer as the butterfly valves. Stem extensions shall be free standing two-piece stem and housing type. Stem extensions shall be stainless steel. Outer housing shall be an epoxy coated carbon steel housing, 100% sealed, with the gear box assembly mounted on top and equipped with a removable manual operating wheel.

333405.9 Installation

Valves shall be installed at the locations and elevations as shown on the Contract Drawings and in accordance with the manufacturer's recommendations. Care should be taken to avoid stripping bolts when tightening.

Flanged butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor shall install valve spacers, subject to the Engineer's approval.

All accessories and appurtenances shall be installed in accordance with the manufacturer's recommendations as well as any facility requirements.

333405.10 Measurement and Payment

See Section 01700.

END OF SECTION

333420.1 Scope of Work

The Contractor shall furnish all labor, materials, supervision, equipment and appurtenances necessary to furnish and install an electric leachate well pump/condensate pump system, complete and ready for operation, in accordance with the Contract Drawings and these Contract Specifications.

333420.2 MATERIALS

PUMP SYSTEM

The pumping systems shall be an electrically driven positive displacement piston pump as manufactured by Blackhawk Technology Company, Glen Ellyn, IL, 800-469-4887, www.blackhawkco.com, or approved equal. The pump motor shall be located above grade. The fluid inlet shall be located at the bottom of the pump intake foot valve.

The pump shall have the pump motor and controls above grade. The pump shall not introduce any electrical power into the well. The pump shall be powered from grade by a fiberglass sucker-rod assembly. Water shall be discharged through a 2" discharge pipe.

The pump shall be able to pump to 0 submergence. Power to the pump shall be direct from grade through the sucker-rod assembly.

The pump materials of construction shall be stainless steel, Buna Nitrile or Viton, and PVC.

Pump motor description:

1. The pump motor shall be located at grade on top of the wellhead assembly.
2. The pump motor assembly shall need one electrical input, three (3) phase, 460 volts.
3. No air or electricity shall be introduced down the well.
4. No air or electricity shall come in contact with the liquid to be pumped.
5. The pump shall use limit switches to cycle the sucker-rod in and out.

Pumping Parameters:

Leachate Pump System:	Min Flow 1 gallons per minute Max Depth 400 ft.

Pump Assembly:

1. The piston pump shall have a down hole stainless steel foot valve cylinder assembly with a stainless steel foot valve seat and check ball. The riser discharge pipe to the surface may be HDPE tubing with stainless steel transition fittings or PVC schedule 80 pipe with threaded male NPT thread on each end with stainless steel couplings.
2. A fiberglass drive rod will connect to the drive motor and to the Delrin piston assembly and will be of sufficient length for the depth of the well. The Delrin piston assembly will incorporate a stainless steel seat and stainless steel check ball. Buna-Nitrile seals will be used on the piston.
3. A Delrin Buna Nitrile seal stuffing box will prevent liquid from escaping from the well where the drive motor shaft enters the well.

PROBE-TYPE LIQUID LEVEL CONTROL SYSTEM (for condensate sump pump applications)

A. The control system shall be manufactured by Warrick Controls or equal, and include control, electrode fitting and electrodes.

B. Electrodes shall be series 3Y corrosion-resistant metallic bars within a protective plastic shield.

C. The electrode fitting shall be Series 3A with external pipe threads for attachment.

D. The control system shall be adjustable, and be capable of starting the pump on high level and stopping the pump on low level in the sump.

E. The control system shall use 120 volt power and be enclosed in a NEMA 3R enclosure for rack mounting.

333420.3 SUBMITTALS

The Contractor shall prepare and submit to the Engineer, for review and approval, manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, and repair of all equipment furnished under this Section. The Contractor shall also submit complete diagrams and elevations showing all components, wires, connections, and numbered terminals, and complete electrical interconnect diagrams showing all wires and terminals between the control panel and external devices.

O & M Manual: Copies of a complete draft O & M manual will be required for review prior to system start-up. The Contractor shall submit to the Engineer copies of a final operations and maintenance manual after startup of the system that incorporate the Engineer's comments on the draft manual. The manual shall be prepared specifically for this installation and shall include all required catalog cuts, record drawings, descriptions, and information necessary to instruct operating personnel unfamiliar with such equipment.

333420.4 EXECUTION

Install electric pump system, control system, pump assembly and all appurtenances in the designated existing extraction wells, and the HDPE Knock-out Pot as described in these Specifications and/or shown on the Drawings.

Install pump, control system, and appurtenances per the manufacturer's instructions and/or recommendations.

END OF SECTION

SECTION 333430 MISCELLANEOUS VALVES AND APPURTENANCES

333430.1 GENERAL

This section shall include miscellaneous valves and appurtenances not specified elsewhere. All valves and appurtenances shall be subject to approval by the Engineer and installed by the Contractor as designated on the plans in accordance with the installation specifications.

333430.2 GATE VALVES

All gate valves shall be designed for a working pressure of 200 psi unless otherwise specified and shall have a clear waterway equal to the full nominal diameter of the pipe and shall be opened by turning counterclockwise. Each valve shall have the initials of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel or operating nut as herein specified and shall have an arrow cast in the metal indicating the direction of opening. Gate valves to be installed underground shall be non-rising stem type while valves installed above ground or in buildings and structures shall have rising stems.

A. Gate Valves 2-inches and Smaller

Gate valves 2-inches and smaller shall be all brass, single disc, double seat tapered wedge type, built to manufacturer's standards with material and construction conforming to AWWA C-500. Each valve shall have a tee handle or handwheel, whichever is applicable, for valve operation. Gate valves installed that will be in contact with leachate shall be constructed of stainless steel.

333430.3 CHECK VALVES

A. Check Valves Smaller Than 3-inches

Swing check valves smaller than 3-inches shall be single disc with renewable bronze seat rings, bronze discs or disc rings and bronze disc hinges and pins and shall be designed to give a full diameter passage. Check valves installed that will be in contact with leachate shall be constructed of stainless steel.

B. Check Valves 3-inches And Larger

Swing check valves 3-inches and larger shall be constructed with heavy cast-iron or cast-steel body with a bronze or stainless steel seat ring and a non-corrosive shaft for attachment of weight and lever. The valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the outlet pressure. The valve disc shall be of cast-iron or cast-steel and shall be suspended from a non-corrosive shaft. Check valves installed that will be in contact with leachate shall be constructed of stainless steel.

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END OF SECTION

SECTION 334100 STORM DRAINAGE MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Modified General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Drains.
6. Encasement for piping.
7. Manholes.
8. Channel drainage systems.
9. Catch basins.
10. Stormwater inlets.
11. Stormwater detention structures.
12. Pipe outlets.
13. Stormwater disposal systems.

1.3 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials

B. CMP: Corrugated Metal Pipe.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High Density Polyethylene.

E. NCDOT: North Carolina Department of Transportation.

F. RCP: Reinforced Concrete Pipe.

1.4 SUBMITTALS

A. Shop Drawings: The Contractor shall submit at least six (6) copies of shop drawings to the Engineer, including dimensional drawings, materials of construction, catalogue cut sheets, and other pertinent information.

1.5 QUALITY ASSURANCE

A. All materials shall be manufactured by suppliers with at least five (5) years of experience in the manufacture of similar materials.

1.6 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations, and in a manner which preserves the structural integrity of the materials.

B. Do not store plastic materials in direct sunlight.

C. Protect pipe, pipe fittings, and seals from dirt and damage.

D. Handle concrete drainage structures according to manufacturer's written rigging instructions.

1.7 WARRANTY

A. All materials and equipment shall be warranted to be free from defects in workmanship and materials for one (1) year after Owner's acceptance.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Engineer no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Engineer's written permission.

PART 2 - PRODUCTS

2.1 CORRUGATED STEEL PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: AASHTO M-36, Type 2, except as modified by NCDOT 1032-3 corrugated steel with rerolled ends.

B. Pipe shall be furnished with manufacturer's "hugger type" coupling bands. The use of dimple bands will not be allowed.

C. All corrugated metal pipe shall have 2-2/3-inches by ½ inch corrugations.

D. Pipe 18-inches and smaller in diameter shall be 16 gauge.

E. Pipes 21-inches through 30-inches in diameter shall be 14 gauge.

F. Pipes 36-inches through 48-inches in diameter shall be 12 gauge.

G. Pipes 48-inches and larger in diameter shall be 10 gauge.

H. When shown on the drawings, pipes shall be furnished with full or partial bituminous coatings and/or paved in accordance with NCDOT 1032-4. Bituminous coatings, where required by the drawings, shall consist of asphalt cement having a minimum thickness of 0.04-inches measured at the crest of the corrugations. Paved inverts in corrugated metal pipe, where required by the drawings, shall consist of asphalt cement applied on the inside of the pipe for one quarter of its circumference (bottom of pipe when installed). The pavement shall have a minimum thickness of 0.50 inches tapering to 0.1 inches at the sides.

2.2 CORRUGATED ALUMIUM ALLOY PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: AASHTO M196, Type 2,and NCDOT 1032-2 aluminized corrugated steel with rerolled ends.

B. Pipe shall be furnished with manufacturer's "hugger type" coupling bands. The use of dimple bands will not be allowed.

C. Pipes 24-inches and smaller in diameter shall be 16 gauge.

D. Pipes 30 inches through 42-inches in diameter shall be 14 gauge.

E. Pipes larger than 42-inches in diameter shall be 12 gauge.

2.3 HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

A. Corrugated HDPE Pipe and Fittings (12-inch to 60-inch): AASHTO M294, Type S, with smooth interior wall, with watertight joints.

B. Pipe and fittings shall be made of virgin polyethylene compounds that comply with the cell classification 435400C, as defined and described in ASTM D3350, except that carbon black content should not exceed 4%. The 12-inch through 24-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 of AASHTO M294.

2.4 CONCRETE PIPE AND FITTINGS

A. Reinforced Concrete Pipe: ASTM C-76, Class III, with Wall Type B, and AASHTO M170, except as modified by NCDOT 1032-9, paragraph B.

B. All pipe shall have interior surfaces free from roughness, projection, indentations, offset or irregularities of any kind.

C. Joint material for reinforced concrete pipe shall be either “O” ring type joints utilizing a rubber “O” ring, or bell and spigot type utilizing a mastic joint material as provided by the pipe manufacturer.

2.5 MANHOLES

A. Standard precast concrete manholes sections shall conform to the latest revision of ASTM C 478. Tapered section and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes where shown or specified. Flat slab tops shall ONLY be utilized when/where approved for use by the Engineer. All manholes shall be constructed to the sizes, shapes and dimensions and at the locations shown on the plans. Unless otherwise shown on the plans, manhole diameters, wall thicknesses and bottom thicknesses shall be as follows:

Pipe Size (inches)	Diameter (feet)	Wall Thickness (inches)	Bottom Thickness (inches)
8 through 18	4	5	6
21 through 36	5	5	8
39 through 54	6	6	8
Larger than 54	8	8	8

B. The minimum wall thickness of all manhole riser sections shall be as shown in the table above. Cone sections shall have a minimum wall thickness of 8 inches at their top. Suitable openings for inlet and outlet pipes shall be cast into

the base section for standard connections and into the riser section for drop connections. These openings shall be circular, accurately located and appropriately sized for each manhole.

C. When indicated on the drawings, precast concrete base sections shall be provided with extended base sections or increased bottom thickness to provide ballast to prevent flotation. When necessary, this ballast shall be provided as shown on the drawings and incorporated into the manhole base section as a monolithic pour.

D. Minimum compressive strength of concrete shall be 4,000 psi at 28 days and shall comply with ACI 318, and ACI 350. The maximum permissible absorption shall be 6.0 percent. All cement used in the mixture shall be in accordance with ASTM C 150, Type II. Fine aggregate shall be sand, while coarse aggregate shall be crushed gravel, both in accordance with ASTM C 33. All water utilized in the concrete mix shall be potable water. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. Welded wire fabric shall be in accordance with ASTM A 185. Steel reinforcing bars shall be grade 60 deformed steel in accordance with ASTM A 615. The tongue or the groove of the joint shall contain one (1) line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross sectional area of steel per linear foot shall be 0.12 square inches. Precast manhole sections shall fit together readily.

E. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Engineer and his Construction Field Representative. The manhole sections shall be perpendicular to their longitudinal axis within the limits listed in ASTM C 478.

F. Joint Sealing Materials: Joints shall be sealed by two (2) butyl rubber seals. Each seal shall be as described below:

1. Butyl Seals shall consist of a plastic or paper-backed butyl rubber rope no less than 1 inch cross section. When manholes are larger than 4 feet diameter or have a larger than normal space between the joints, the length and or diameter of the rope shall be increased as required to achieve a seal. Butyl rubber material shall conform to Federal Specification SS-S210A, AASHTO M-198, Type B - Butyl Rubber and as follows: maximum of 1 percent volatile matter and suitable for application temperatures between 10 and 100 degrees F. Butyl rubber shall be applied to clean, dry surfaces only. Use of 2 independent wraps of Butyl Rubber qualifies for the requirement of two seals.

2. Internal O-Ring Gaskets and Internal Rubber Gaskets shall not be used.

G. Manhole Steps

1. Steps shall be a copolymer polypropylene plastic reinforced with a ½ inch diameter, grade 60 bar and have serrated tread and tall end lugs. Step pull out strength shall be a minimum of 2,000 pounds when tested according to ASTM C-497.

2. Steps shall be required in all structures with a depth greater than four (4) feet. Steps shall be vertically aligned and uniformly spaced for the entire depth of the structure. Steps shall be located in the structures along the vertical face of the eccentric cone and so as to land upon a bench.

3. Steps shall be vertically spaced between twelve (12) and sixteen (16) inches on center. Step width shall be a minimum of twelve (12) inches. Steps shall protrude from the wall of the structure a minimum of five (5) inches and a maximum of seven (7).

4. Secure steps to the wall with a compression fit in tapered holes. Steps shall not be vibrated or driven into freshly cast concrete. Steps shall not be grouted in place.

H. Precast Grade Rings and Brick

1. Precast reinforced concrete grade rings or brick shall be used to adjust ring and covers to finished grade. No more than 12 vertical inches of grade rings or brick will be allowed per manhole. Grade rings shall conform to ASTM C478 and shall be no less than 6 inches and no more than 9 inches in height with a diameter matching that of the frame and cover.

2. All brick used shall be solid and shall be made from Concrete, Clay, or Shale, and shall be of standard building size.

2.6 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4,000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3,000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615, Grade 60 deformed steel.

2.7 PRECAST CONCRETE BOXES

A. All rectangular drainage structures shall meet the requirements of NCDOT Standard Specifications for Roads and Structures (latest edition) articles 840-1 through 840-3 as well as NCDOT Standard Detail 840.45. No waffle boxes shall be allowed. All pipe openings in precast structures must be cast or cored.

B. Curb inlet catch basins shall conform to NCDOT Standard Details 840.02 and 840.04.

C. Drop inlets shall conform to NCDOT Standard Detail 840.14.

D. Junction boxes shall conform to NCDOT Standard Detail 840.31

E. Manhole Steps

1. Steps shall be a copolymer polypropylene plastic reinforced with a ½ inch diameter, grade 60 bar and have serrated tread and tall end lugs. Step pull out strength shall be a minimum of 2,000 pounds when tested according to ASTM C-497.

2. Steps shall be required in all structures with a depth greater than four (4) feet. Steps shall be vertically aligned and uniformly spaced for the entire depth of the structure. Steps shall be located in the structures along the vertical face of the structure.

3. Steps shall be vertically spaced between twelve (12) and sixteen (16) inches on center. Step width shall be a minimum of twelve (12) inches. Steps shall protrude from the wall of the structure a minimum of five (5) inches and a maximum of seven (7).

4. Secure steps to the wall with a compression fit in tapered holes. Steps shall not be vibrated or driven into freshly cast concrete. Steps shall not be grouted in place.

F. Precast Grade Rings and Brick

1. Precast reinforced concrete grade rings or brick shall be used to adjust frames and covers to finished grade. No more than 12 vertical inches of grade rings or brick will be allowed per structure. Grade rings shall conform to ASTM C478 and shall be no less than 6 inches and no more

than 9 inches in height with a diameter matching that of the frame and cover.

2. All brick used shall be solid and shall be made from Concrete, Clay, or Shale, and shall be of standard building size.

2.8 FRAMES, GRATES AND HOODS

A. All metal castings and grating shall meet the requirements of NCDOT Standard Specifications for Roads and Structures (latest edition) articles 1074-7 and 1074-9.

B. All metal castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arises. Machined joints, where required, shall be milled to a close fit. Provide all necessary lugs and brackets so that work can be assembled in a neat, substantial manner.

C. Frames, grates and hoods for curb inlets shall conform to NCDOT Standard Detail 840.03.

D. Frames and grates for drop inlets shall conform to NCDOT Standard Detail 840.16.

E. Frames and covers for junction boxes shall conform to NCDOT Standard Detail 840.54. Include indented top design with lettering cast into cover, using wording "STORM SEWER."

2.9 AGGREGATE FOR UNDERDRAINS

A. Aggregate for underdrains shall be washed stone, standard size number 67 per North Carolina Department of Transportation specifications, Section 1005.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PREPARATION OF PIPE FOUNDATION

A. Lines and Grades: The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustments will require the approval of the Engineer. When a Construction Field Representative is present on the site and is so requested by the Contractor, he shall check the position of grades and lines; but the Contractor shall be responsible for the finished drain line being laid to exact and proper line and grade.

B. Pipe Foundation:

1. Whenever the nature of the ground will permit, the excavation at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe.

2. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6”. A suitably tamped and shaped foundation of suitable earth shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

3. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within the limits established on the plans, and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.

C. Water in Trenches: The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing

and no pipes shall be laid until the water has been removed from the trench. The Contractor will not be permitted to drain water through the storm drain within a period of 24 hours after the pipe has been laid, and the open end of the pipe in the trench shall be kept closed with a tight fitting plug to prevent washing of dirt or debris into the line. Water so removed from the trench must be disposed of in such manner as not to cause injury to work completed or in progress.

D. Special Foundations: Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on timber or concrete cradle foundations. Such foundations whether of single plank, plank cradle, plank cradle supported on piles, or poured concrete cradle, shall be placed by the Contractor and compensation will be allowed the Contractor for the materials so used.

3.3 PIPING INSTALLATION

A. General: All piping is to be installed in strict accordance with the manufacturer's recommendations. Installation manuals from various material suppliers shall be furnished to the Engineer for his review and approval prior to installation of any material. The Engineer may augment any manufacturer's installation recommendations, if in his opinion it will best serve the interest of the Owner.

B. Laying Pipe:

1. No pipe shall be laid except in the presence of the Engineer or his Construction Field Representative or without special permission from the Engineer. Proper tools, implements, and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be carefully given a final inspection to see that it is clean, sound and free of defects. It shall be laid on the prepared foundation to produce a straight line on a uniform grade, each pipe being laid as to form a close abutted joint with a preceding pipe, so as to form a smooth and straight inside flow line. Each pipe will be tested for its exact position after it is in its final position. The pipes shall be fitted together in order to insure sufficient space for joint gaskets, and other jointing material. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

2. When cutting short lengths of pipe, a pipe cutter as approved by the Engineer will be used, and care will be taken to make the cut at right angles to the center line of the pipe, or on the exact skew as shown on the plans. In the case of push on pipe, the cut ends shall be tapered with a portable grinder of coarse file to match the manufactured taper.

3. When coupling bands for annular or helical corrugated metal pipe are used, the pipe sections shall be joined and fully bolted so that the circumferential and longitudinal strength will be sufficient to preserve the alignment, prevent separation of the sections, and to prevent infiltration of backfill material.

3.4 CONCRETE STRUCTURE INSTALLATION

A. Drainage structures shall be built to the lines, grades and dimensions as shown on the plans. The Contractor shall adjust the final grades in the field as necessary to provide positive drainage to the structures or to match final pavement or grade elevation.

B. Excavations for drainage structures shall be made with care so as not to disturb the surrounding areas more than necessary. All excavations shall be maintained water free until completion of the drainage structure, including backfilling. The Contractor shall provide adequate pumping capacity as required.

C. Where the foundation material is found to be of poor supporting value, the existing foundation material shall be removed by undercutting to the depth directed by the Engineer and backfilled with suitable material secured from locations along the project or from a borrow pit. The backfill placed in the undercut area shall be compacted to a degree satisfactory to the Engineer.

D. Precast concrete sections shall be lifted from the side of the excavation to the bottom of the trench with equipment and support slings capable of safely handling the weight of the concrete pieces. The structure shall be set plumb and adjusted to the final finished surface grade with brick and mortar.

E. For cast-in-place structures the Contractor shall use care in placing rebar and concrete. Unless otherwise approved, the bottom slabs shall be poured separate from the walls. A minimum of seven (7) days cure time shall be provided between completion of pouring the bottom and the walls.

F. Pipe openings shall be exactly aligned to that of the pipe(s) entering and/or leaving the structure. The pipe lines shall be placed in the structure openings, properly aligned, and set to grade.

G. When existing drainage structures are constructed of concrete brick, only new, sound brick shall be used to modify those structures. Mortar mix shall be mixed

on site using an approved mortar mix consisting of Portland Cement (Type S), and clean sand. Following the modification of existing drainage boxes, both the interior and exterior shall be plastered with a minimum ½-inch thick coat of Portland Cement and sand mixture.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 FITTINGS AND CONNECTIONS

A. Where fittings enter masonry, they shall be placed as the work is built up, thoroughly bonded, and accurately spaced and aligned.

B. Pipe connections shall be cut off flush with the inside wall of the drainage structure and grouted as necessary to make smooth and uniform surfaces on the inside of the structure.

C. Metal frames for grates and covers shall be set in full mortar beds or secured by methods approved by the Engineer.

D. Pipe collars and pipe plugs shall be constructed in accordance with the details shown on the plans or as directed by the Engineer.

3.7 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

   1. Close open ends of piping with at least 24-inch thick, concrete bulkheads.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

   1. Remove manhole or structure and close open ends of remaining piping.

   2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 36 inches of top with CABC. Fill to top with compacted earth fill.

C. Backfill to grade according to Division 31 Section "Earth Moving."

3.8 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Upon completion, installed lines shall show a full circle of light when "Lamped" between drainage structures. This test shall be performed by the Engineer.

B. Other tests may be required by the Engineer, such as exfiltration. In this event the results shall meet the minimum standards that the manufacturer states are obtainable.

C. The Contractor shall demonstrate to the Owner and Engineer that all drainage structures operate as intended and designed. All drainage structures shall be field tested by the Contractor in the presence of the Engineer prior to final acceptance.

D. Replace defective piping and structures using new materials, and repeat inspections until defects are within allowances specified.

E. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

3.9 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100

APPENDIX 1

SITE SPECIFIC CONSTRUCTION QUALITY ASSURANCE PLAN

SITE SPECIFIC CONSTRUCTION QUALITY ASSURANCE PLAN

Francis Farm Landfill
Restrictive Cover Design Plan
Haywood County, North Carolina

This Construction Quality Assurance Plan has been prepared in general conformance to Rule .1621 and .1627 of the North Carolina Department of Environmental Quality Rules of Solid Waste Management.

1.0 INTRODUCTION

1.1 Project Background

The Francis Farm Landfill Site has been utilized for disposal of municipal solid waste beginning in the early 1970's and received closure certification in December 1995. As part of the Corrective Action Plan, the current project involves the construction of a restrictive cover as identified during the recent Assessment of Corrective Measures (ACM) process. This project will include using structural fill to achieve the desired gradients followed by a 40-mil linear low density polyethylene (LLDPE) textured geomembrane liner, a 8-ounce double-sided geocomposite, raising existing LFG extraction wells, landfill gas and leachate collection piping, and 2'-6" of vegetative support soil.

1.2 Project Scope

The purpose of this Site Specific Construction Quality Assurance Plan (SSCQAP) is to provide guidance to Construction Quality Assurance consultant and Contractor on required documentation activities during the construction of the restrictive cover. This guidance is intended to ensure that construction meets the requirements of Haywood County, and project drawings and specifications. Additionally, the program will identify and define problems that may occur during construction and ensure that these problems are corrected before the construction is complete. At completion of work, the program will culminate in a certification report, which will document that, the soil material and geomembrane liners have been constructed in substantial compliance with this SSCQAP, project drawings and specifications.

1.2.1 Scope of Services

The Scope of Services provided by CQA Consulting Firm for the construction of the restrictive cover base is as follows:

1. Pre-Construction materials evaluation (structural fill, geosynthetics).
2. Structural Fill observation, testing, documentation, and verification of construction procedures.

3. Geomembrane observation, testing, documentation, and verification of construction procedures.
4. Geocomposite observation, testing, documentation, and verification of construction procedures.
5. Vegetative support soil observation, testing, documentation, and verification of construction procedures.
6. Provide CQA Report and CQA Certification that barrier cap was constructed in accordance with this SSCQAP.

1.2.2 Construction Schedule

Construction shall be completed within 365 consecutive calendar days.

Description
Preconstruction Meeting Structural Fill Subgrade Installation
Primary Geomembrane Liner Installation
Vegetative Support Layer
Submit CQA Report and CQA Certification

2.0 Parties Involved

2.1 Owner: Haywood County

Contact: David Francis
Title: Program Administrator

2.2 Design and Permitting Engineer: McGill Associates, P.A.

Contact: Mark D. Cathey, P.E. (828) 252-0575
Title: Project Engineer

2.3 General Contractor

Contact: Unknown
Title:

2.3.1 Surveyor

Contact: Unknown
Title:

2.3.2 Geosynthetic Manufacturer

Contact: Unknown
Title:

2.3.3 Geosynthetic Installer

Contact: Unknown

2.4 Construction Quality Assurance (CQA) Consultant: BLE, Inc.

Contact: Jeff Helvey
Title: Principal Engineer

2.4.1 Geosynthetic Testing Laboratory

Contact:
Title:

2.4.2 Soils Laboratory (permeability testing)

Contact:
Title:

3.0 Preconstruction Meeting

A Preconstruction meeting will be held prior to the beginning of construction. The following people shall be present: Owner representative, Project Engineer, CQA Consultant, General Contractor, Geosynthetics Installer, and all other subcontractors.

The following items will be discussed at a minimum:

Any questions about the SSCQAP will be addressed and any modifications that result will be documented. Any modifications to the approved SSCQAP will be submitted to the North Carolina Department of Environmental Quality (NCDEQ), Division of Waste Management, Solid Waste Section.

- Special permits and state and/or federal regulations.
- Responsibilities, expectations, and roles of each party.
- Lines of authority and proper lines of communication.
- Procedures for documenting and reporting information.

- Distribution and storage of documents and reports.
- Protocol for testing and geosynthetic sample management.
- Protocol for handling construction deficiencies.
- Protocol for repairs and re-testing.
- Conduct site walk through:

  Discuss work plans
  Inspect material handling and storage locations
  Review office facilities (copy machine, mailing, etc.)

- Review detailed time schedule for all operations.
- Review work area security, check-in procedure, and safety protocol.
- Establish procedures for material processing.
- Review site health and safety requirements.

The Preconstruction Meeting will be documented by McGill Associates and a copy of the meeting minutes will be distributed to all parties who attend.

4.0 Definitions

4.1 Construction Quality Assurance

A planned and systematic application of all means and actions designed to provide adequate confidence that items or services meet design and specifications requirements and will perform satisfactorily in service. In the context of the geomembrane liner system, construction quality assurance refers to means and actions employed by the CQA Consultant, CQA Senior Lead Technician, and the CQA Consultants to ensure conformity of the construction with guidelines set forth in the SSCQAP, construction plans, and construction specifications.

4.2 Construction Quality Control

Those actions which provide a means to measure and regulate the characteristics of an item or services to design, and specifications requirements. In the context of the geosynthetic liner system installation, quality control refers to those actions taken by the Geosynthetic Contractor/Manufacturer to ensure that the product and the workmanship meets the requirements set forth in the SSCQAP, construction plans, and construction specifications.

4.3 Project Engineer

The individual or firm responsible for the preparation of this SSCQAP, construction drawings, and construction specifications.

4.4 General Contractor

The firm responsible for the complete construction of the soil, geosynthetic components, and pipe work of the landfill as specified in this SSCQAP and as shown on the construction drawings and construction specifications.

4.5 Construction Quality Assurance (CQA) Consultant

The firm responsible for observing, testing and documenting activities related to construction quality assurance during the installation of the structural soil material, geomembrane liner, geocomposite, landfill gas and leachate collection piping, and vegetative support soil material. The CQA Certifying Engineer is responsible for issuing a summary certification and documentation report bearing his/her Professional Engineering Seal. The CQA Consultant is responsible for the management of on-site CQA personnel and providing the Project Engineer and Owner with a daily report of the construction activities.

5.0 DOCUMENTATION PROCEDURES

5.1 Standard Reporting Procedures

The CQA Consultant shall issue a daily report of construction activities. These reports shall include, as a minimum, the following information:

An identifying sheet number for cross-referencing and documentation control.

Date, project name, location and other identification.

1. Weather conditions.

2. Problems encountered and resolutions.

3. Descriptions and locations of ongoing construction.

4. Equipment and personnel in each work area, including subcontractors.

5. Descriptions and specific locations of areas or units of work being tested and/or observed and documented (identified by coordinates or seam/panel numbers).

6. Locations where samples were taken.

7. A summary of test results, failures, and re-tests.

5.2 CQA Consultant shall monitor geomembrane installation and shall perform and/or provide the following information and services:

a. Material delivery (time, date, and physical condition of material)
b. Unloading and on-site storage and transport
c. Sampling for conformance testing
d. Deployment operations (roll #, panel #, approved QA\QC cert, thickness, overlap, defects, etc.)
e. Seam preparation (proper overlap and cleanliness)
f. Seaming operations (seaming method, seam#, welding technician, welding apparatus #, welder settings, ambient temperature, chronological order of seams welded, seam length, etc.)
g. Conditions of panel before and after placement
h. Locate and document all defects in the geomembrane material.
i. Repairs (location, method, technician, date, etc.)
j. Trial seams (monitor preparation and testing)
k. Nondestructive testing (visual observation and documentation)
l. Sampling for destructive seam testing (locating test location)
m. Final walkovers (confirm defect repairs)

5.3 Applicable Forms

As a minimum, the CQA Consultant will utilize the following forms for the project:

1. Daily Meeting/Field Report
2. Weekly Meeting/Progress Report
3. Monthly Meeting/Progress Report
4. Nuclear Density Testing
5. Drive Cylinder Test Report
6. Soil Testing Tracking Log
7. Certificate of Acceptance of Soil Subgrade
8. Geomembrane Materials Inventory Checklist
9. Weather Log
10. Trial Weld Form
11. Panel Deployment
12. Panel Seaming

13. Nondestructive Seam Testing
14. Destructive Sample Test Log
15. Geomembrane Defect Log
16. Geomembrane Repair Log
17. Construction Site Safety Form
18. Construction Photo Log
19. Certificate of Completion

5.4 Problem/Deficiency Identification and Corrective Action Report

The CQA Consultant is required to inform the General Contractor and/or the Geomembrane Contractor, or their representatives, in a timely manner, of any difference between the interpretation of the SSCQAP, the construction plans and construction specifications by the contractor versus the CQA Consultant's interpretation. In addition, any actual or suspect work deficiencies shall be brought to the Project Engineer's and Owner's attention.

A special meeting shall be held when and if a problem or deficiency is present. At a minimum, the meeting shall be attended by the General Contractor, the Owner, the Project Engineer, and the CQA Consultant. If the problem involves a possible design modification, the Project Engineer shall be notified. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:

1. Define and discuss the problem or deficiency
2. Review alternative solutions
3. Implement an action plan to resolve the problem or deficiency

The CQA Consultant or his representative will document all proceedings.

Any changes and/or modifications to the SSCQAP must be approved by the Owner, Project Engineer, Project Engineer, CQA Certifying Engineer, and the NCDEQ Solid Waste Section.

5.5 Plan Modifications

Design and/or specification changes shall be made only with written approval of the Owner, the Project Engineer and the Project Engineer. Substantial design changes shall also require approval from the NCDEQ Solid Waste Section.

5.6 Scope Change

The CQA Consultant shall notify the Project Engineer whenever additional engineering services are requested by Owner that exceed the original scope of services.

5.7 Photographic Documentation

Photographs taken to document observations, problems, and/or deficiencies, or work in progress. Digital photographs will be saved and sorted by date by the CQA team. One set of digital files shall be turned over to both the Owner and Project Engineer at the conclusion of the project. The CQA team will be responsible to ensure that the photographs are clear representations of the work.

The following is a list of minimum photographs to be taken during cell construction:

1. Subgrade/Structural Fill/Select Backfill proof rolling
2. Geomembrane conformance sampling
3. Geomembrane deployment
4. Fusion welding devices
5. Extrusion welding devices
6. Air testing
7. Vacuum box testing
8. Seaming
9. Destructive sample location and removal
10. Trial welds
11. Tensiometer testing
12. Geotextile deployment
13. On-site lab soil testing
14. Progress photographs
15. Design modifications
16. Construction deficiencies
17. Completed construction

5.8 Final Construction Documentation Report

After the placement of the vegetative support layer, the CQA Consultant shall prepare a final certification documentation report. This report shall document the installation of the structural fill, geomembrane liner system, landfill gas and leachate collection piping, and vegetative support layer. The CQA Consultant shall certify that the project has been constructed in substantial accordance with this SSCQAP, the construction drawings, and the construction specifications. A Draft Copy of this report shall be issued to the Project Engineer as soon as possible after the placement of the vegetative support layer and LFG and leachate collection piping. The final report shall be issued to the Project Engineer at the completion of the project. For this project, two (2) copies of the draft version, five (5) copies of the final version of the report, and a digital copy of the final version of the report, complete with all attachments shall be issued.

5.9 Format of CQA Report

As a minimum, the certification report will contain the following items for discussion in the narrative portion of the report. The proposed table of contents is:

5.9.1 Table of Contents

Section

5.3 **Summary of Information**

1.1 Narrative
1.2 Reference Information

2.0 Soil Preconstruction Data

2.1 Proctors
2.2 Soil Density/Moisture
2.3 Soil Classification

3.0 Structural Fill Field Data

3.1 Moisture Content
3.2 Field Density Testing

4.0 Soil Laboratory Data

5.1 Construction Proctors
5.2 Soil Classification

5.0 Geomembrane Quality Control

6.1 Manufacturer's Q.C.
6.2 Installer Resumes
6.3 Material Conformance Testing

6.0 Geomembrane Liner Field Data

7.1 Weather Log
7.2 Trial Welds
7.3 Panel Placement
7.4 Panel Seaming
7.5 Non-Destruct Test
7.6 Destruct Test

7.7 Repair Log
7.8 Installed Quantities
7.9 Defect Location Map

7.0 Geocomposite Quality Control

8.1 Manufacturer's Q.C.
8.2 Installer Resumes
8.3 Material Conformance Testing

8.0 Geocomposite Field Data

9.1 Weather Log
9.2 Trial Welds
9.3 Panel Placement
9.4 Panel Seaming
9.5 Non-Destruct Test
9.6 Destruct Test
9.7 Repair Log
9.8 Installed Quantities
9.9 Defect Location Map

9.0 Vegetative Support Soil Layer Data

10.1 Preconstruction testing
10.2 Field and laboratory testing
10.3 Sieve analysis

10.0 Project Meeting Minutes

11.0 Construction Photographs

12.0 Pertinent Information

5.9.2 List of Drawings

As a minimum, the certification will include in an appendix the following proposed list of drawings:

- Geomembrane Panel Layout
- Defect Location Map
- Topographic Survey giving elevation of the existing ground elevations, the geomembrane liner system and the top of vegetative layer based on a before and after topographic survey.

5.10 Site Surveying Requirements

The CQA Consultant shall coordinate all survey activities with the surveyor, provided by the Contractor. Survey services will be required for initial site layout, subgrade elevations, primary geomembrane as-built survey, and final grades. The certification surveys will be as directed by the CQA Consultant and shall include the following items:

- Panel placement and seaming locations
- Location of destructive testing samples
- Location of all significant repairs
- Topographic survey of existing ground elevations
- Topographic survey of top of top of select backfill/geomembrane liner system
- Topographic survey of top of vegetative support layer

6.0 LANDFILL CONSTRUCTION-EARTHWORK

6.1 Subgrade/ Structural Fill Preparation

6.1.1 Subgrade

Subgrade preparation shall be performed by the General Contractor and in accordance with the construction drawings and construction specifications.

The General Contractor shall be responsible for preparing the subgrade prior to placement of the geomembrane liner system and is responsible for constructing the subgrade in accordance with the technical specifications.

Before beginning placement of the Geomembrane Liner System:

1. The CQA Consultant shall document that a licensed land surveyor has verified that all grades and elevations are consistent with the approved engineering plans.

2. The CQA Consultant shall document that he/she has visually inspected the subgrade surface to evaluate its suitability and that the subgrade meets the criteria specified in the project specifications.

3. The prepared subgrade/structural fill/select backfill shall be proof-rolled using a smooth-drum roller (minimum 20 tons) making a minimum of two (2) passes in each direction or other procedures and equipment approved by the Project Engineer.

4. The CQA Consultant shall document that the subgrade has been tested for conformance to the construction specifications as noted in the following section.

6.1.2 Subgrade/Structural Fill

Structural fill shall be the soil placed to achieve the design subgrade contours. The subgrade will be tested for field density and field moisture content at a minimum frequency of one (1) test per 5,000 cubic yards placed. Testing will also consist of visual observation and documentation of proof-rolling with a smooth-drum roller (minimum 20 tons) with at least two (2) passes in each direction or by other procedures and equipment approved by the Project Engineer. If a nuclear gauge is used as the primary means of construction testing, the instrument shall be calibrated properly and test data shall be verified using alternate test methods such as drive cylinders. An alternate test method shall be used at least once for every hundred tests performed with the nuclear gauge. The alternate test method should be performed in the same area as an instrument reading in order to allow accurate comparison of the data resulting from the two tests.

Preconstruction Qualification Structural Fill		
Test	**ASTM Method**	**Quantity**
Natural Moisture Content	D2216	1/5,000 YD^3
Laboratory Compaction	D698	1/5,000 YD^3

Preconstruction test samples shall be taken from the borrow source and or clay stockpiled prior to construction.

Construction Testing SUBGRADE/STRUCTURAL FILL TESTING FREQUENCIES		
TEST	ASTM METHOD	QUANTITY
Field Density	D6938, D1556, D2937	1/40,000 SF/ Lift
Field Moisture	D2216, D6938, D4643	1/40,000 SF/ Lift

6.2 Select Backfill Placement and Testing

Select backfill will be utilized for the top 6" of the structural fill. This material will have the same preconstruction and testing requirements as the structural fill, with the exception that the preconstruction and construction testing will have to be performed to show conformance with the Maximum Particle Size requirements. The testing requirements are as follows:

Preconstruction Qualification Select Backfill		
Test	**ASTM Method**	**Quantity**
Natural Moisture Content	D2216	1/5,000 YD^3
Laboratory Compaction	D698	1/5,000 YD^3
Grain Size Analysis	D422	1/5,000 YD^3
*** Preconstruction test samples shall be taken from the borrow source and or clay stockpiled prior to construction.**		
Construction Testing Select Backfill		
Test	**ASTM Method**	**Quantity**
Field Density	D6938, D1556, D2937	1/40,000 SF/ Lift
Field Moisture	D2216, D6938, D4643	1/40,000 SF/ Lift
Grain Size Analysis	D422	1/5,000 YD^3
Permeability	D5084	1/40,000 SF/ Lift

The geomembrane shall be capable of providing an interface friction (shear) resistance of ≥ 27 degrees or an equivalent shear strength (combination of friction angle and cohesion) between the geocomposite/geomembrane interface and geomembrane/select backfill soil layer interface. Direct Shear Box testing prior to construction shall verify this friction angle. The tests shall be performed using representative bulk samples of the proposed construction materials.

6.3 Vegetative Support Layer

6.3.1 Materials and Construction

The final layer of the cap will be composed of 30" of soil of native soils. The bottom 24" shall have no stones larger than 2" in diameter and the top 6" of the vegetative support layer shall have no stones greater than 1' in diameter. The soil is not required to have a specific classification; however, it should be a cohesive soil.

The final cover will be a minimum of 30-inches thick including at least 6-inches of soil suitable for sustaining native plant growth. The soil cover will provide support for a vegetative cover and protect the low-permeability barrier.

The geocomposite shall be capable of providing an interface friction (shear) resistance of ≥ 27 degrees or an equivalent shear strength (combination of friction angle and cohesion) between the geocomposite/geomembrane interface and geocomposite/vegetative soil layer interface. Direct Shear Box testing prior to construction shall verify this friction angle. The tests shall be performed using representative bulk samples of the proposed construction materials.

Table 2 - QA Testing Frequencies and Criteria for Vegetative Support Soil Layer

Preconstruction Qualification Vegetative Support Layer		
Test	**ASTM Method**	**Quantity**
Natural Moisture Content	D2216	1/5,000 YD^3
Grain Size Analysis	ASTM D422	1/5,000 YD^3
Laboratory Compaction	D698 – Standard	1/5,000 YD^3
Permeability	D5084	1/10,000 YD^3
*** Preconstruction test samples shall be taken from the borrow source and or material stockpiled prior to construction.**		
Construction Testing Vegetative Support Layer		
Test	**ASTM Method**	**Quantity**
Field Density	D2922, D1556, D2167	1/40,000 SF/ Lift
Field Moisture	D2216, D3017, D4643	1/40,000 SF/ Lift
Grain Size Analysis	D422	1/5,000 YD^3

If a nuclear gauge or low exposure "EGauge" is used as the primary method for construction testing of the compacted soils, the test data shall be verified by alternate test methods at least once for every 25 tests performed.

Any modifications made to these testing frequencies will require prior approval from the Division of Solid Waste.

6.3.2 Placement

The vegetative soil layer shall be placed with a minimum compacted thickness of 18 inches. Equipment used during placement of the vegetative soil layer shall not be allowed to operate directly on the geomembrane. Tracked equipment will not be allowed on any portion of the geomembrane without the protective geocomposite and a minimum of 18 inches of soil layer material in place. Soil material is to be pushed uphill beginning at the bottom of the slope and not to be placed and spread downhill. Soil layer material shall not be pushed along the surface of the geomembrane under any circumstances. Pushing of the soil layer material will only be allowed on areas where the material has a depth greater than 18 inches, and the required 18-inch depth shall be maintained at all times.

Placement of the vegetative support soil layer shall be performed by a light tracked dozer or light dump truck not in direct contact with the geomembrane. A minimum depth of 18 inches of soil layer material must be maintained at all times during placement activities when vehicles other than the light tracked dozer are needed. High traffic areas, such as access roads constructed to transport material into the landfill, should have a minimum depth of four (4) feet. This depth may be changed by written approval from Owner or an engineered design approved by the Project Engineer.

The soil layer shall be placed in the coolest part of the day when possible in order to reduce the potential for wrinkles forming in the geomembrane. See Sections 1.4.2 and 1.1.5 of Appendix C for information on evaluating and repairing wrinkles in the geomembrane.

The CQA Consultant will observe placement activities. The General Contractor is to provide laborers ahead of soil material placement to assist in minimizing wrinkle formation of the geomembrane. Temperature variations may impact the Contractor's ability to place this material.

6.3.3 Depth Verification

CQA Consultant(s) will randomly verify soil layer depth utilizing test pits or survey means. A Licensed Surveyor will survey the top of the soil layer to certify proper depth was achieved. The General Contractor may use depth markers (i.e., painted tubes, flags, traffic cones, etc.) during placement to provide depth control and minimize possible damage to geomembrane. Depth markers shall be removed as the soil layer is completed. Depth markers shall not be constructed of a material that could potentially puncture the geomembrane and shall be approved by the Project Engineer.

7.0 LANDFILL CONSTRUCTION-GEOSYNTHETICS

7.1 Geosynthetics

The geomembrane shall be capable of providing an interface friction (shear) resistance of ≥ 27 degrees or an equivalent shear strength (combination of friction angle and cohesion) between the geomembrane/geocomposite interface. Direct Shear Box testing prior to construction shall verify this friction angle. The tests shall be performed using representative bulk samples of the proposed construction materials.

Before beginning placement of the Geomembrane Liner System:

2. The CQA Consultant shall document that a licensed land surveyor has verified that all grades and elevations are consistent with the approved engineering plans.

3. The CQA Consultant shall document that he/she has visually inspected the subgrade surface to evaluate its suitability and that the subgrade meets the criteria specified in the project specifications.

4. The prepared subgrade/structural fill/select backfill shall be proof-rolled using a smooth-drum roller (minimum 20 tons) making a minimum of two (2) passes in each direction or other procedures and equipment approved by the Project Engineer.

5. The CQA Consultant shall document that the subgrade has been tested for conformance to the construction specifications as noted in the following section.

The geosynthetic component will be approved by the CQA Consultant when:

The installation of the geosynthetic components has been completed in accordance with this SSCQAP and the Technical Specifications.

Verification of the adequacy of all seams including associated testing and repairs, if any, is completed in accordance with this SSCQAP and the Technical Specifications.

1. All documentation of installation is completed.

2. The Geosynthetic CQA Consultant is able to recommend acceptance.

7.2 Geomembrane Quality Control

The Geomembrane Contractor/Manufacturer will provide geomembrane quality control in accordance with Appendix A.

7.3 Geomembrane Quality Assurance

7.3.1 Conformance Sampling

Conformance testing will be done on-site as material arrives and is inventoried. Conformance sampling procedures will be in accordance with Appendix A.

7.4 Geomembrane Seaming

Field seaming will be done in accordance with Appendix B.

7.4.1. Double Tracked Fusion Welding

All seaming performed shall utilize the double-tracked fusion process when possible. Detailing and repairs do not require double tracked fusion welding.

7.4.2 Extrusion Welding

Extrusion welding shall only be used when double-tracked fusion welding is not possible. The extrusion process will be utilized for repair or detail work, attaching temporary rain flaps, capping a failed seam, or completion of other appurtenances that cannot be performed with fusion welding.

7.5 Geomembrane/Seam Repairs

All repairs to the geomembrane or seams shall be done utilizing the extrusion welding process. All repair work shall be conducted in accordance with Appendix B.

7.6 Geocomposite Quality Control

The Geocomposite Contractor/Manufacturer shall provide quality control information in accordance with Appendix C.

7.7 Geocomposite Quality Assurance

Conformance sampling will be performed on-site as material arrives and is inventoried. All conformance sampling will be in accordance with Appendix C.

Appendix A

1.0 Geomembranes

1.1 Description and Applicability

Geomembranes are low permeability geomembrane barriers used in lining systems. This Section is applicable to the textured linear low density polyethylene (LLDPE) geomembrane.

1.2 Manufacturing Plant Inspection

The Owner or other appropriate representative may conduct an inspection of the Manufacturer's plant. In addition, the Project Engineer, or his designated representative, may visit the manufacturing plant for a project-specific inspection if deemed necessary. If possible, the project-specific inspection shall be prior to or during the manufacturing of the geomembrane rolls for that particular project. The purpose of the plant inspection is to review the manufacturing process and quality control procedures.

The manufacturing plant inspection shall include:

Verification that properties guaranteed by the manufacturer are met and meet all the project specifications.

Verification that the measurement of properties by the Manufacturer is properly documented and test methods used are acceptable.

Spot inspection of the rolls and verification that they are free of imperfections or any sign of contamination by foreign matter.

Review of handling, storage, and transportation procedures, and verification that these procedures will not damage the geomembrane.

Verification that roll packages have a label indicating the name of the manufacturer, type of geomembrane, thickness, roll number, and roll dimensions.

Verification that extrusion rods and/or beads are produced from the same base resin type as the geomembrane.

A report describing the inspection shall be retained by the Owner and by the Project Engineer for project-specific inspections.

1.3 Quality Control Documentation

Prior to the shipment of any geomembrane, the Manufacturer shall provide the CQA Consultant with the following information:

1. The origin (supplier's name and production plant) and identification (brand name and number) of the resin used to manufacture the geomembrane.

2. Copies of dated quality control certificates issued by the resin supplier.

3. Results of tests conducted by the Manufacturer to verify that the resin used to manufacture the geomembrane meets the project specifications.

4. A statement indicating that the amount of reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness.

5. A list of the materials that comprise the geomembrane, expressed in the following categories as percent by weight: polyethylene, carbon black, other additives.

6. A specification for the geomembrane that includes all properties contained in the project specifications measured using the appropriate test methods.

7. Written certification that minimum values given in the specification are guaranteed by the Manufacturer.

8. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for the following:

Property	Test Method	Frequency
Thickness	ASTM D-5994 (Textured)	Each Roll
Relative Density	ASTM D-1505	Every 5th roll
Tensile Properties	ASTM D6693 Type IV	Every 5th roll
Tear Resistance	ASTM D1004 Die C	Every 5th roll
Puncture Resistance	ASTM D-4833	Every 5th roll
Carbon Black Content	ASTM D-1603 or D-4218	Every 5th Roll
Carbon Black Dispersion	ASTM D-5596	Every 5th Roll

The Manufacturer shall identify all rolls of geomembranes with the following:

Manufacturer's name
Product identification
Thickness
Roll number
Roll dimensions

The CQA Consultant shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The CQA Consultant shall verify that:

Property values certified by the Manufacturer meet all of its guaranteed specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.

Rolls are appropriately labeled.

Certified minimum properties meet the project specifications.

1.4 Conformance Testing

1.4.1 Sampling Procedures

Upon delivery of the rolls of the geomembrane, the CQA Consultant shall ensure that conformance test samples are obtained for the geomembrane. The geomembrane rolls to be sampled shall be selected by the CQA Consultant. Samples shall be taken across the entire width of the roll judged by the CQA Consultant not to be damaged. Unless otherwise specified, samples shall be 3 ft (1 m) long by the roll width. The CQA Consultant shall mark the machine direction on the samples with an arrow. Unless otherwise specified in the project specifications, samples shall be taken at a rate of one per lot and not less than one per 100,000 ft^2 (10,000 m^2) of geomembrane. These samples shall be forwarded to the CQA Consultant for testing.

A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. Alternatively, a lot may be designated by the Certifying CQA Consultant based on a review of all roll information including quality control documentation and manufacturing records.

If the Project Engineer desires, the CQA Consultant can perform the conformance test sampling at the manufacturing plant. This may be advantageous in expediting the installation process for very large projects.

1.4.2 Conformance Tests

The following conformance tests shall be conducted:

Property	Test Method
Relative Density	ASTM D-1505
Carbon Black Content	ASTM D-1603 or D-4218
Carbon Black Dispersion	ASTM D-5596
Thickness - Smooth	ASTM D-5199
Thickness - Textured	ASTM D-5994
Tensile Properties	ASTM D6693, Type IV

Other conformance tests may be required by the project specifications.

1.4.3 Test Results

All conformance test results shall be reviewed and accepted or rejected by the Certifying CQA Consultant prior to the deployment of the geomembrane. The Certifying CQA Consultant shall examine all results from laboratory conformance testing and shall report any non-conformance to the Project Engineer. The Certifying CQA Consultant shall be responsible for checking that all test results meet or exceed the property values listed in the project specifications.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out-of-specification and rejected. Alternatively, at the option of the Project Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting the project specification. This procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line. To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next large roll number) shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

1.5 Geomembrane Specifications

1.5.1 Materials

The geomembrane materials used for construction shall be in strict accordance with the technical specifications.

1.5.2 Construction

The geomembrane liner shall be installed as soon as practical after completion and approval of the compacted subgrade/structural fill or portion thereof. The top of the compacted subgrade will be surveyed to ensure proper grades have been achieved. The geomembrane is to cover the subgrade in accordance with the Contract Drawings.

Areas to receive liner installation should be relatively smooth and even, free of ruts, voids, large particles, etc., to the extent required by the Engineer. This shall be accomplished by final dressing of the compacted subgrade with smooth drum rollers. No vehicles are permitted on final dressed surfaces unless authorized by the Engineer.

An anchor trench (as illustrated on the Contract Drawings) will be required to secure the geomembrane at the edges of the landfill. No loose soil will be allowed to underlie the geomembrane in the anchor trenches. The time schedule for excavation and backfilling of the anchor trenches is to be approved by the Engineer so that desiccation of trench soils does not occur prior to backfilling. The contractor shall install internal anchor trenches as necessary in order to secure the liner during construction, in accordance with the requirements of the geomembrane manufacturer.

Before the geomembrane installation begins, a meeting will be held prior to installation (pre-deployment meeting). The geomembrane installer, CQA Consultant or his representative, and a representative of the Owner will be in attendance. The following issues will be discussed and agreed upon by all parties and shall be included in a report in the CQA documentation: a.) testing of welds, b.) characteristics of a "good" weld, c.) repair procedures, and d.) other pertinent construction issues. Additionally, the CQA Consultant shall verify that:

1) A State of North Carolina licensed Professional Land Surveyor has verified all lines and grades of the compacted subgrade/structural fill.

2) A qualified and licensed Professional Engineer has verified that the subgrade surface meets the criteria specified in the project specifications.

3) The subgrade surface to be lined has been rolled, compacted, or hand-worked so as to be free of irregularities, protrusions, loose soil, and abrupt changes in grade.

4) The surface of the subgrade does not contain stones, which may be damaging to the geomembrane.

5) There is no area excessively softened by high water content.

6) There is no area where the subgrade surface contains desiccation cracks, which may damage the geomembrane.

7) The compacted subgrade meets the required elevations and that all tests have been performed.

8) The geomembrane to be deployed has an absolute minimum thickness of 40 mils and passing conformance samples at the frequencies specified in Section 1.4.1 of this Appendix A and be documented.

The Installer shall certify in writing that the surface on which the geomembrane will be installed is acceptable. A certificate of acceptance shall be given by the Installer to the CQA Consultant prior to commencement of geomembrane deployment in the area under consideration. The Certifying CQA Consultant shall be given a copy of this certificate by the CQA Consultant.

After the underlying soil has been accepted by the Installer, it is the Installer's responsibility to indicate to the General Contractor any change in the underlying soil condition that may require repair work. The General Contractor will consult with the CQA Consultant regarding the need for repairs. If the CQA Consultant concurs with the Installer, the General Contractor shall ensure that the underlying soil is repaired.

At any time before or during the geomembrane installation, the CQA Consultant shall indicate to the General Contractor any locations which may not be adequately prepared for the geomembrane.

The CQA Consultant shall verify that the **anchor trenches** are constructed in accordance with the following:

1) The anchor trench has been constructed according to the project plans and specifications.

2) If the anchor trench is excavated in a clay material susceptible to desiccation, the amount of trench open at any time is minimized. The CQA Consultant shall inform the Contractor and Project Engineer of any signs of significant desiccation associated with the anchor trench construction.

3) Rounded corners are provided in the trench so as to avoid sharp bends in the geomembrane.

4) Excessive amounts of loose soil are not allowed to underlie the geomembrane in the anchor trench.

5) The anchor trench is adequately drained to prevent ponding or softening of the adjacent soils while the trench is open.

6) The anchor trench is backfilled and compacted as outlined in the project specifications.

Care shall be taken when backfilling the trenches to prevent any damage to the geomembrane components. The CQA Consultant shall observe the backfilling operation and advise the Contractor and Project Engineer of any problems. Any problems shall be documented by the CQA Consultant in his daily report.

Appendix B

1.0 Field Seaming

1.1.1 Seam Layout

Before installation begins, the Installer shall provide the CQA Consultant and the Project Engineer with a panel layout drawing. This drawing shall present all the proposed seams of the lining system at the facility. The Project Engineer and the CQA Consultant shall review the panel layout drawing and verify that it is consistent with the technical specifications and the Division approved plans. No panels may be seamed until written approval of the panel layout drawing has been provided by the Project Engineer. In addition, panels not specifically shown on the panel layout drawing may not be used without the Project Engineer's prior approval.

In general, seams should be oriented parallel to the line of maximum slope, thus, oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than 10 ft (3.0m) from the toe or crest of the slope, or areas of potential stress concentrations, unless otherwise authorized by the Project Manager.

A seam numbering system compatible with the panel numbering system shall be used by the CQA Consultant and the CQA Consultants.

1.1.2 Accepted Seaming Methods

Approved processes for field seaming are fusion welding and extrusion welding. Proposed alternate processes shall be documented and submitted by the Installer to the Project Engineer for approval. Only apparatuses that have been specifically approved by make and model shall be used. The Contractor shall submit all documentation regarding seaming methods to be used to the CQA Consultant for review.

1.1.2.1 Fusion Process

The CQA Consultant shall log ambient temperature, seaming apparatus, and geomembrane surface temperatures at appropriate intervals and report any noncompliances to the CQA Consultant.

The CQA Consultant shall verify that:

The Installer maintains on-site the number of spare operable seaming apparatuses agreed upon at the pre-construction meeting.

Equipment used for seaming is not likely to damage the geomembrane.

The electric generator is placed on a smooth base such that no damage occurs to the geomembrane.

A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage such that no damage occurs to the geomembrane.

1. A movable protective layer is used as required by the Installer directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets and to prevent debris from collecting around the pressure rollers.

2. In general, the geomembrane panels are aligned to have an overlap of 4 to 6 in (100 mm to 150 mm) for fusion welding. In any event, the final overlap shall be sufficient to allow peel tests to be performed on the seam.

3. No solvent or adhesive is used.

4. The geomembrane is protected from damage in heavy traffic areas.

1.1.2.2 Extrusion Process

The CQA Consultant shall log ambient temperature, seaming apparatus, and geomembrane surface temperatures at appropriate intervals and report any noncompliances to the CQA Consultant.

The CQA Consultant shall verify that:

The Installer maintains on-site the number of spare operable seaming apparatuses agreed upon at the pre-construction meeting.

Equipment used for seaming is not likely to damage the geomembrane.

Prior to beginning a seam, the extruder is purged until all heat-degraded extrudate has been removed from the extruder barrel.

Clean and dry welding rods or extrudate pellets are used.

The electric generator is placed on a smooth base such that no damage occurs to the geomembrane.

Grinding is completed no more than one hour prior to seaming.

A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage such that no damage occurs.

The geomembrane is protected from damage in heavy traffic areas.

Exposed grinding marks adjacent to an extrusion weld shall be minimized. In no instance shall exposed grinding marks extend more than 1/8 in (6 mm) from the finished seamed area.

In general, the geomembrane panels are aligned to have a nominal overlap of 3 in (75 mm) for extrusion welding. In any event, the final overlap shall be sufficient to allow peel tests to be performed on the seam.

No solvent or adhesive is used.

The procedure used to temporarily bond adjacent panels together does not damage the geomembrane; in particular, the temperature of hot air at the nozzle of any temporary welding apparatus is controlled such that the geomembrane is not damaged

1.1.3 Seam Preparation

The CQA Consultants shall verify that prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris or foreign material of any kind. If seam overlap grinding is required, the CQA Consultants must ensure that the process is completed according to the Manufacturer's instruction within one hour of the seaming operation, and in a way that does not damage the geomembrane. The CQA Consultants shall also verify that seams are aligned with the fewest number of wrinkles and "fishmouths".

1.1.4 Test Seams

Test seams shall be made on fragment pieces of geomembrane liner to verify that conditions are adequate for production seaming. Test seams shall be performed in accordance with Section 02623 of the technical specifications.

1.1.5 General Seaming Procedures

During general seaming, the CQA Consultants shall ensure the following:

Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 in (150 mm) beyond the cut in all directions.

If seaming operations are carried out at night, adequate illumination shall be provided.

Seaming shall extend to the outside edge of panels placed in the anchor trench.

All cross seam tees should be extrusion welded to a minimum distance of 4 in (100 mm) on each side of the tee.

No field seaming shall take place without the Master Seamer being present.

A firm substrate may be required to be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.

The CQA Consultant shall verify that the above seaming procedures or any other procedures agreed upon and indicated in the Preconstruction Meeting or construction progress meetings are followed, and shall inform the Project Engineer of any nonconformance.

1.1.6 Seaming Weather Conditions

1.1.6.1 Cold Weather Conditions

To ensure a quality installation, if seaming is conducted when the ambient temperature is below 40°F (5°C), the following conditions shall be met:

Geomembrane surface temperatures shall be determined by the CQA Consultant at intervals of at least once per 100 feet (30 m) of seam length to determine if preheating is required. For extrusion welding, preheating is required if the surface temperature of the geomembrane is below 41°F (5°C).

1. For fusion welding, preheating may be waived by the Project Engineer based on a recommendation from the CQA Consultant, if the Installer demonstrates to their satisfaction that welds of equivalent quality may be obtained without preheating at the expected temperature of installation.

2. If preheating is required, the CQA Consultants shall observe all areas of geomembrane that have been preheated by a hot air device prior to seaming, to ensure that they have not been overheated.

3. Care shall be taken to confirm that the surface temperatures are not lowered below the minimum surface temperatures specified for welding due to winds or other adverse conditions. It may be necessary to provide wind protection for the seam area.

4. All preheating devices shall be approved prior to use by the CQA Consultant.

Additional destructive tests shall be taken at an interval between 250 feet and 500 feet 75 to 150 m) of seam length, at the discretion of the CQA Consultant.

Sheet grinding may be performed before preheating, if applicable.

Test seams shall be conducted under the same ambient temperature and preheating conditions as the production seams. Under cold weather conditions, additional trial seams shall be conducted if the ambient temperature drops by more than 10°F from the initial trial seam test conditions. Such new seams shall be constructed upon completion of seams in progress during temperature drop.

1.1.6.2 Warm Weather Conditions

At ambient temperatures above 104°F, no seaming of the geomembrane shall be permitted unless the Installer can demonstrate to the satisfaction of the CQA Consultant that geomembrane seam quality is not compromised. Test seams shall be conducted under the same ambient temperature conditions as the production seams. At the option of the CQA Consultant, additional destructive tests may be required for any suspect areas.

1.2 Nondestructive Seam Testing

1.2.1 Concept

The Installer shall nondestructively test all field seams over their full length using an air pressure test (for double fusion seams only, a vacuum test or other approved method. Air pressure testing and vacuum testing are described in the following sections. The purpose of nondestructive tests is to check the continuity of seams. It does not provide quantity information on seam strength. Nondestructive testing shall be carried out as the seaming work progresses, not at the completion of all field seaming.

For all seams, the CQA Consultants shall:

Observe nondestructive testing procedures.

Record location, data, test unit number, name of tester, and outcome of all testing.

Inform the Installer and CQA Consultant of any required repairs.

Any seams that cannot be nondestructively tested shall be cap-stripped. The cap-stripping operations shall be observed by the CQA Consultant and Installer for uniformity and completeness.

1.2.2 Air Pressure Testing

Air pressure testing is applicable to double fusion welding which produces a double seam with an enclosed space.

The Equipment for air pressure testing shall consist of the following:

An air pump (manual or motor driven), equipped with pressure gauge and capable of generating and sustaining a pressure between 25 and 30 psi (160 and 200 kPa) and mounted on a cushion to protect the geomembrane.

A rubber hose with fittings and connections.

A sharp hollow needle, or other pressure feed device, approved by the CQA Consultant.

The following procedures shall be followed:

Seal both ends of the seam to be tested.

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

Insert a protective cushion between the air pump and the geomembrane.

Pressurize the air channel to a pressure of approximately 30 psi (200 Kpa). Close valve, allow 2 minutes for pressure to stabilize, and sustain pressure for at least 5 minutes. Pressure loss over the 5-minute period should not exceed 4 psi.

If loss of pressure exceeds the maximum permissible pressure differential as outlined in the project specifications or does not stabilize, locate fault area and repair in accordance with Section 1.4.3.

Cut opposite end of tested seam area once testing is complete to verify continuity of the air channel. If air does not escape, locate blockage and retest unpressurized area.

Remove needle or other approved pressure feed device and grind and weld or patch the hole in the geomembrane.

1.2.3 Vacuum Testing

Vacuum testing is applicable to extrusion welding.

The equipment shall consist of the following:

A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, a porthole or valve assembly, and a vacuum gauge.

A pump assembly equipped with a pressure controller and pipe connections.

A rubber pressure/vacuum hose with fittings and connections.

A soapy solution. (CQA Consultants shall ensure solution makes bubbles when air is passed through.)

A bucket and wide paint brush, or other means of applying the soapy solution.

The following procedures shall be followed:

Wet a strip of geomembrane approximately 12 in X 48 in (0.3 m X 1.2 m) with the soapy solution.

Place the box over the wetted area.

Close the bleed valve and open the vacuum valve.

Ensure that a leak-tight seal is created.

Energize the vacuum pump and reduce the applied pressure to approximately 5 psi (10 in of Hg/35kPa) gauge.

For a minimum of 10 seconds, apply vacuum with the box placed and maintaining a seal, examine the geomembrane through the viewing window for the presence of soap bubbles.

If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 in (75 mm) overlap, and repeat the process.

All areas where soap bubbles appear shall be marked and repaired in accordance with Section 1.4.3.

1.2.4 Test Failure Procedures

The Installer shall complete any required repairs in accordance with Section 1.4.3. For repairs, the CQA Consultant shall:

Observe the repair and testing of the repair.

Mark on the geomembrane that the repair has been made.

Document the repair procedures and test results.

1.3 Destructive Seam Testing

1.3.1 Concept

The purpose of destructive tests is to evaluate seam strength. Destructive seam tests shall be performed at selected locations. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

1.3.2 Location and Frequency

The CQA Consultant shall select where seam samples will be cut out for laboratory testing. The frequency and locations shall be established as follows:

A minimum frequency of one test location per 500 feet (150 m) of seam length performed by each welding machine. This frequency is to be determined as an average taken throughout the entire facility.

Test locations shall be determined during seaming at the discretion of the CQA Consultant or the Project Engineer. Special consideration shall be given to locations where the potential for imperfect welding, such as overheating, contamination, and offset welds exists.

1.3.3 Sampling Procedures

Samples shall be cut by the Installer at locations chosen by the CQA Consultant as the seaming progresses so that laboratory test results are available before the geomembrane is covered by another material. The CQA Consultant shall:

Observe sample cutting.

1. Assign a number to each sample, and mark it accordingly.

2. Record sample location on layout drawing.

3. Record reason for taking the sample at this location (e.g., statistical routine, suspicious feature of the geomembrane).

All holes in the geomembrane resulting from destructive seam sampling shall be repaired in accordance with repair procedures described in Section 1.4.3 immediately following receipt of successful test results. The continuity of the new seams in the repaired area shall be tested according to Section 1.2.3. All holes in the geomembrane shall be temporarily patched or repaired in accordance with Section 1.4.3 before the end of each work day in order to protect the compacted subgrade from inclement weather.

1.3.4 Sampling Procedure

Destructive sampling shall be performed in accordance with Section 02623 of the technical specifications.

1.3.5 Field Testing

Destructive field testing shall be performed in accordance with Section 02623 of the technical specifications.

1.3.6 Destructive Test Failure

Destructive test failures shall be handled in accordance with Section 02623 of the technical specifications.

1.4 Defects and Repairs

1.4.1 Identification

All seams and non-seam areas of the geomembrane shall be examined by the CQA Consultants for identification of defects, holes, blisters, undispersed raw materials, large wrinkles and any sign of contamination by foreign matter. The geomembrane surface shall be cleaned by the Installer prior to examination if the CQA Consultant determines that the amount of dust or mud inhibits examination.

1.4.2 Evaluation

Each suspect location both in seam and non-seam areas shall be nondestructively tested using the methods described in Section 1.2. Each location which fails the nondestructive testing shall be marked by the CQA Consultant and repaired by the Installer. Work shall not proceed with any materials that will cover locations that have been repaired until successful nondestructive and/or laboratory tests are obtained.

When seaming of the geomembrane is completed, and prior to placing overlying materials, the CQA Consultant shall indicate to the General Contractor any large wrinkles that should be cut and reseamed by the Installer. The number of wrinkles to be repaired should be kept to an absolute minimum. Therefore, wrinkles should be located during the coldest part of the installation period, while keeping in mind the forecasted weather to which the undercover geomembrane may be exposed. Wrinkles are considered to be large when the geomembrane can be folded over onto itself which is generally a wrinkle that extends 12 in (0.3 m) from the subgrade. Seams produced while repairing wrinkles shall be nondestructively tested.

When placing overlying material on the geomembrane, every effort must be made to minimize wrinkle development. If possible, cover should be placed during the coolest weather. In addition, small wrinkles should be isolated and covered as quickly as possible to prevent their growth. The placement of cover materials shall be observed by McGill Associates or a CQA Consultant to ensure that wrinkle formation is minimized and that, in all cases, the geomembrane is not folded over on itself.

1.4.3 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or 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 determined by the Project Engineer and the CQA Consultant.

1. The repair procedures available include:

    a. Patching, used to repair holes, tears, undispersed raw materials, and contamination by foreign matter.

    b. Spot welding used to repair pinholes, or other minor, localized flaws.

    c. Capping, used to repair large lengths of failed seams.

    d. Extrusion welding the flap, used to repair areas of inadequate fusion seams which have an exposed edge. Repairs of this type shall be approved by CQA Consultant and shall not exceed 100 ft (30 m) in total length.

    e. Removing bad seam and replacing with a strip of new material welded into place.

2. 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 ground 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 meet the requirements of this SSCQAP.

d. Patches or caps shall extend at least 6 in (150 mm) beyond the edge of the defect, and all corners of patches shall be rounded with a radius of approximately 3 in (75 mm).

1.4.4 Repair Verification

The CQA Consultants shall observe all nondestructive testing of repairs and shall record the number of each repair, date and test outcome. Each repair shall be nondestructively tested using the method described in Section 1.2 as appropriate. Repairs that pass the nondestructive test shall be taken as an indication of an adequate repair. Repairs more than 500 ft (50 m) long require destructive test sampling. Failed tests require that the repair shall be redone and re-tested until a passing test results.

1.5 Geomembrane Protection

The quality assurance procedures indicated in this Section are intended only to assure that the installation of adjacent materials does not damage the geomembrane. The quality assurance of the adjacent materials themselves are covered in separate Sections of this manual.

1.5.1 Soils

1. Placement of soil on the geomembrane shall not proceed at an ambient temperature below 32 degrees F (0 degrees C) nor above 104 degrees F (40 degrees C) unless otherwise specified.

2. Placement of soil on the geomembrane should be done during the coolest part of the day to minimize the development of wrinkles in the geomembrane.

3. Equipment used for placing soil shall not be driven directly on the geomembrane.

4. A minimum thickness of 18 inches of soil shall be maintained between the geotextile cushion and the top of the vegetative layer. Off-road trucks shall have a minimum thickness of 4 feet between them and the geomembrane/geotextile cushion.

5. In any areas traversed by heavy construction, any vehicles other than low ground pressure vehicles approved by the Project Engineer, the soil layer shall have a minimum thickness of 4 ft. This requirement may be waived if provisions are made to protect the geomembrane through an engineered design approved by the Project Engineer. Drivers shall proceed with caution when traveling on the overlying soil and prevent spinning of tires or sharp turns.

6. Landfill Gas and Leachate Collection pipes shall not be crossed with construction equipment. In areas where off-road trucks must repeatedly cross the piping, a temporary stone road shall be build to bridge over the pipe and maintain a minimum thickness of three (3) feet.

7. Care shall be taken to avoid creating wrinkles in the geomembrane during placement of the soil layer.

Appendix C

1.0 Geocomposites

1.1 Definition and Applicability

Geocomposites are geomembrane nets with geotextile heat bonded to the surface. The geocomposite can be single-sided or double-sided depending on the application. They are used as a drainage medium in lining systems, where the properties of the geotextile can either serve as a filter media from clogging the geonet or increase stability of the lining system. This Section is applicable to geocomposites where the geonet portion is made of high density polyethylene (HDPE), including "foamed" HDPE products but is not applicable to geocomposites where the geonet is made of other polymers.

1.2 Manufacturing Plant Inspection

The Owner or appropriate representative may conduct a periodic inspection of the Manufacturer's plant. In addition, the Project Engineer, or his designated representative may visit the manufacturing plant for a project-specific inspection if deemed necessary. If possible, the project-specific inspection shall be prior to or during the manufacturing of the geocomposite rolls for that particular project. The purpose of the inspection is to review the manufacturing process and quality control procedures.

The manufacturing plant inspection shall include:

Verification that properties guaranteed by the Manufacturer are met and meet all project specifications.

1. Verification that properties guaranteed by the Manufacturer are met and meet all Project Technical Specifications.

2. Verification that the measurement of properties by the Manufacturer is properly documented and test methods used are acceptable.

3. Spot inspection of the rolls and verification that they are free of imperfections or any sign of contamination by foreign matter.

4. Review of packaging, handling, storage, and transportation procedures and verification that these procedures will not damage the geocomposite.

5. Verification that the geotextiles are inspected continuously for the presence of needles using a metal detector.

6. Verifications that roll packages have a label indicating the name of the manufacturer, type of geocomposite, roll number and roll dimensions.

A report describing the inspection will be retained by the Owner for periodic inspections and by the Project Engineer for project-specific inspections.

1.3 Production

The geocomposite shall be manufactured by heat bonding the geotextile to the HDPE drainage net on one or both sides. No burn through geotextiles shall be permitted. No glue or adhesive shall be permitted.

The geonet portion of the geocomposite shall be manufactured by extruding two sets of strands to form a three (3) dimensional structure to provide planar water flow.

1.4 Quality Control Documentation

Prior to the shipment of any geocomposite, the Manufacturer shall provide the CQA Consultant with the following information:

1. The origin (supplier's name and production plant) and identification (brand name and number) of the resin used for geonet.

2. Copies of dated quality control certificates issued by the geonet resin supplier.

3. Results of tests conducted by the Manufacturer to verify that the resin used to manufacture the geonet meets the Project Technical Specifications.

4. A statement indicating that the amount of any reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness.

5. A list of the materials that comprise the geonet, expressed in the following categories as a percent by weight: polyethylene, carbon black, other additives.

6. Results of tests conducted by the Manufacturer to verify that the material used to manufacture the geotextile meets the Project Technical Specifications.

7. A specification for the geocomposite that includes all properties contained in the Project Technical Specifications measured using the appropriate test methods.

8. Written certification that minimum values given in the Project Technical Specification are guaranteed by the Manufacturer.

9. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, testing procedures, and results of quality control tests. At a minimum, results shall be given for the following:

GEONET COMPONENT		
Property	**Test Method**	**Frequency**
Density	ASTM D1505 or ASTM D792, Method B	Every 5th Roll
Thickness	ASTM D5199	Each Roll
Carbon Black Content	ASTM D1603 or D4218	Every 5th Roll
Peak Tensile Strength	ASTM D7179	Every 5th Roll
Transmissivity	ASTM D4716	Every 5th Roll
GEOTEXTILE COMPONENT		
Property	**Test Method**	**Frequency**
Mass per Unit Area	ASTM D5261	Each Roll
Grab Tensile Strength	ASTM D4632	Every 5th Roll
Grab Tensile Elongation	ASTM D4632	Every 5th Roll
Puncture Strength	ASTM D6241	Every 5th Roll
Permittivity (min. avg.)	ASTM D4491	Every 5th Roll
Apparent Opening Size (AOS)	ASTM D4751	Every 5th Roll
UV Stability, % Retained (500 hr.)	ASTM D4355	Every 5th Roll
GEOCOMPOSITE		
Property	**Test Method**	**Frequency**
Ply Adhesion	ASTM D7005	Every 5th Roll
Transmissivity (MARV)*	ASTM D4716	Every 5th Roll

*Note: Using ASTM D4716 – Modified (100 hour transmissivity of geocomposites), conduct testing for transmissivity at the confining pressure resulting from the planned vegetative soil layer loading. Test at a gradient of 0.33 under 500 psf normal load. The boundary conditions are site soils planned for use as the vegetative soil layer above the geocomposite, with textured 40-mil LLDPE geomembrane on the bottom of the geocomposite. Minimum required transmissivity required $\geq 3.2 \times 10^{-3}$ m^2/s for the 13.5:1 H:V slopes with lateral drainage outlets every 19 vertical feet and 3:1 H:V slopes with lateral drainage outlets every 74 vertical feet. The vegetative soil layer sample will be selected by the Owner's CQA Consultant and provided to the geocomposite manufacturer. Compaction criteria (moisture and density) of soils will be provided to the geocomposite manufacturer by the CQA Consultant. The geomembrane used by the geocomposite manufacturer to perform transmissivity testing should be the same product used in the closure cap.

The manufacturer shall identify all rolls of geocomposite with the following:

Manufacturers Name
Product Identification
Roll Number
Roll Dimensions

The CQA Consultant shall review these documents and shall report any discrepancies with the above requirements to the Project Engineer. The CQA Consultant shall verify that:

Property values certified by the Manufacturer meet all of its guaranteed specifications.

Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.

Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.

Rolls are appropriately labeled.

Certified minimum properties meet the project specifications.

1.5 Conformance Testing

1.5.1 Sampling Procedures

Upon delivery of the rolls of geocomposite, the CQA Consultant shall ensure that conformance test samples are obtained for the geocomposite. The rolls to be sampled shall be selected by the CQA Consultant. Samples shall be taken from any portion of a roll that has not been damaged. Unless otherwise specified, samples shall be 3 ft. (2 m) long by the roll width. The CQA Consultant shall mark the machine direction on the samples with an arrow.

A lot shall be defined as a group of consecutively numbered rolls from the same manufacturing line. Alternatively, a lot may be designed by the Certifying CQA Consultant based on a review of all roll information including quality control documentation and manufacturing records.

Unless otherwise specified in the project specifications, samples shall be taken at a rate of one per lot, not to be less than one per 100,000 ft^2 of geocomposite. These samples shall then be forwarded to the Geomembrane laboratory for testing to ensure conformance to the project specifications.

1.5.2 Conformance Tests

The following conformance tests shall be conducted;

Ply Adhesion (ASTM D7005)
Transmissivity (ASTM D4716)

1.5.3 Test Results

All conformance test results shall be reviewed and accepted or rejected by the Certifying CQA Consultant prior to the deployment of the geocomposite. The Certifying CQA Consultant shall examine all results from laboratory conformance testing and shall report any non-conformance to the Project Engineer. The Certifying CQA Consultant shall be responsible for checking that all test results meet or exceed the property values listed in the project specifications.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out-of-specification and rejected. Alternatively, at the option of the Project Engineer, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting the project specification. This procedure is valid only when all rolls in the lot are consecutively produced and numbered from one manufacturing line. To isolate the out-of-specification material, additional samples must be taken from rolls that have roll numbers immediately adjacent to the roll that was sampled and failed. If both additional tests pass, the roll that represents the initial failed test and the roll manufactured immediately after that roll (next large roll number) shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of rolls within the lot.

1.5.4 Soils

1. Placement of soil on the geocomposite shall not proceed at an ambient temperature below 32 degrees F (0 degrees C) nor above 104 degrees F (40 degrees C) unless otherwise specified.

2. Placement of soil on the geocomposite should be done during the coolest part of the day to minimize the development of wrinkles in the geocomposite.

3. Equipment used for placing soil shall not be driven directly on the geocomposite.

4. Off-road trucks shall have a minimum thickness of 3 feet between them and the geocomposite/geotextile cushion.

5. In any areas traversed by heavy construction, any vehicles other than low ground pressure vehicles approved by the Project Engineer, the soil layer shall have a minimum thickness of 4 ft. This requirement may be waived if provisions are made to protect the geocomposite through an engineered design approved by the Project Engineer. Drivers shall proceed with caution when traveling on the overlying soil and prevent spinning of tires or sharp turns.

6. Landfill Gas Collection pipes shall not be crossed with low ground pressure construction equipment without the full 30 inches of soil in place. In areas where

off-road trucks must repeatedly cross the leachate piping, a temporary stone road shall be built to bridge over the pipe and maintain a minimum thickness of 4 feet.

7. Care shall be taken to avoid creating wrinkles in the geocomposite during placement of the soil layer.

APPENDIX 2

REPORT OF GEOTECHNICAL EXPLORATION RATCLIFFE COVE BRANCH STREAM CROSSING

REPORT OF GEOTECHNICAL EXPLORATION

RATCLIFFE COVE BRANCH STREAM CROSSING
FRANCIS FARM LANDFILL
HAYWOOD COUNTY, NORTH CAROLINA
PERMIT NUMBER 4403-MSWLF-1982

Prepared For:
MCGILL ASSOCIATES
55 BROAD STREET
ASHEVILLE, NORTH CAROLINA 28801

BLE North Carolina Business License C-1538

BLE Project Number J19-1957-77

July 19, 2019

BUNNELL LAMMONS ENGINEERING
6004 Ponders Court | Greenville, SC 29615
864.288.1265 864.288.4330 info@blecorp.com
BLECORP.COM

BUNNELL LAMMONS ENGINEERING

July 19, 2019

McGill Associates
55 Broad Street
Asheville, NC 28801

Attention: Mr. Mark Cathey, P.E.

Subject: **Report of Geotechnical Exploration**
Ratcliffe Cove Branch Stream Crossing
Francis Farm Landfill
Haywood County, North Carolina
Permit No. 4403-MSWLF-1982
BLE Project No. J19-1957-77

Dear Mr. Cathey:

Bunnell-Lammons Engineering, Inc. (BLE) is pleased to provide this report detailing our geotechnical exploration, evaluation and recommendations in support of the design and construction of the stream crossing section of a new access drive for Francis Farm Landfill. McGill Associates, P.A. (McGill), at the request of Haywood County, is designing the access drive and has requested BLE's assistance for the section crossing Ratcliffe Cove Branch.

We appreciate the opportunity to serve as your geotechnical consultants at this site. If you have any questions, please do not hesitate to contact us at (864) 288-1265.

Sincerely,

BUNNELL-LAMMONS ENGINEERING INC.
NC BUSINESS LICENSE NO. C-1538

NORTH CAROLINA PROFESSIONAL SEAL 023614 ENGINEER JAMES J. BELGERI

7/19/19

Conner P. Tennessen, E.I.T.
Staff Professional

James J. Belgeri, P.E.
Senior Engineer
NC Registration # 023614

cc: Andrew W. Alexander, P.G., RSM

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1.0 PROJECT INFORMATION

The following project information was obtained from documents provided by Haywood County and from site data (in BLE's project records) from our other current services contracts with Haywood County.

Haywood County owns and maintains the Francis Farm Landfill, which no longer accepts waste and is in post closure care. Francis Farm Landfill was operational prior to the promulgation of the Subtitle D rules beginning in 1973 and accepted municipal solid waste (MSW) and industrial wastes prior to closure in October 1993. The facility is an unlined landfill. The Haywood County Consolidated School District currently owns and operates an office and bus garage on the property and utilizes additional areas of the facility for bus parking.

McGill Associates (McGill) has been retained by Haywood County to provide engineering services related to the post-closure care of the landfill. The county has requested that McGill design an access drive to the former Betty Lewis parcel, located in the northwest corner of the landfill property, as part of the Francis Farm Landfill restrictive cover construction. This access drive would include crossing Ratcliffe Cove Branch to the east of Francis Farm Road via a conveyance which may be a twin-barrel box culvert or an arched span. McGill has requested that BLE complete a geotechnical investigation to assist with the design and construction of the access drive at the stream crossing section.

As noted, the designer is considering two approaches to conveyance of the branch beneath the new road. Our understanding of the two methods is as follows:

> **Box Culvert** – A twin tube box culvert is under consideration for this conveyance. The conceptual sketches provided to BLE show two 8-foot by 8-foot culverts embedded 1 foot into the streambed with modular block headwalls and wing walls. The bottom elevation of the culverts is planned at about 2,600.5 msl.
>
> **Arched Span** – A single-radius arched span is also under consideration for this conveyance. The conceptual sketches provided to BLE show an 18-foot span with an approximate 9-foot rise above stream bed. The conceptual plan shows the arch being supported by concrete foundations in either bank of the branch.

BLE is of the opinion that the foundations of either concept can be adapted to the subsurface conditions, as detailed in the following sections of this report.

2.0 FIELD EXPLORATION

The site was explored by drilling three soil test borings (ASTM D 1586) at the approximate locations shown on the attached Boring Location Plan (**Appendix A**). Borings were drill on the southeast side of Ratcliffe Cove Branch only, since steep grades and overhead utilities precluded access to the other side of the branch. Subsurface conditions on the northwest side of Ratcliffe Cove Branch may be similar, although this area has not been explored.

The soil test borings were performed using an ATV-mounted drill rig turning 2-1/4 inch I.D. hollow-stem augers. The soil test borings were advanced to depths ranging from 4 to 12 feet below the existing ground surface. Soil samples were obtained in accordance with ASTM D 1586 by driving a 1-3/8 inch I.D. split-

spoon sampler with a 140-pound safety hammer. Boring locations were selected and established in the field by McGill personnel.

Soil test boring logs were produced by examining the soil samples. The soil descriptions on the field logs were based on visual examination and grain-size estimations in accordance with the Unified Soil Classification System (USCS). The final boring log records are included in **Appendix B**. The boring locations and elevations shown in **Appendix B** should be considered approximate. A description of our field procedures is also included in **Appendix B**.

3.0 SITE GEOLOGY

The subject site is located within the Blue Ridge geologic belt. The geology of the Blue Ridge Belt consists of metamorphic Precambrian basement rock overlain with unconformable younger Precambrian metamorphosed sedimentary and igneous rocks. The Blue Ridge belt is bordered to the southeast by the Brevard belt and to the northwest by the Valley and Ridge. The Precambrian basement has undergone several episodes of uplift, deformation, faulting, intrusion, metamorphism and erosion.

Locally, the site is geologically underlain by the lower portion of the Middle/Late Proterozoic Coweeta Group known as the Persimmon Creek Gneiss, which overlies the Tallulah Falls Formation. The Persimmon Creek Gneiss consists of migmatitic feldspar-quartz-biotite gneiss interlayered and gradational with biotite-garnet gneiss and amphibolite. The original protolith of the gneiss bedrock is most likely highly metamorphosed clastic sediments.

The typical residual soil profile consists of clayey and silty soils near the surface, where soil weathering is more advanced, underlain by micaceous sandy silts and silty sands. Residual soil zones develop by the in situ chemical weathering of bedrock and usually consist of micaceous sand with large rock fragments and lesser amounts of clay and silt. The boundary between soil and rock is not sharply defined. Alluvial soils are also present in the stream valleys which consist of silty sands and sandy silts with some streambed gravels. These sediments are deposited by fluvial processes and are primarily derived from the erosion of the saprolite and weathered rock.

A transitional zone of partially weathered rock (PWR) is normally found overlying the parent bedrock. Partially weathered rock is defined, for engineering purposes, as residual material with standard penetration resistance (ASTM D 1586) in excess of 100 blows per foot (bpf). Fractures, joints, and the presence of less resistant rock types facilitate weathering. Consequently, the profile of the partially weathered rock and hard rock is quite irregular and erratic, even over short horizontal distances. Also, it is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

4.0 SURFACE FEATURES

The site is in the Blue Ridge Physiographic Province. The province is characterized by steep mountain ridges with intermontane basin and valleys. The area consists of rugged mountain terrane of the southern Appalachian Mountain system.

Topographically, the site is a stream valley generally running north-northeast to south-southwest which slopes up west to meet Francis Farm Road and east through pastureland and woodlands toward the top of Francis Farm Landfill. The western slope climbs in elevation from approximately 2,600 feet above sea

level (MSL) at Ratcliffe Cove Branch to approximately 2,616 feet MSL at the existing grade of Francis Farm Road at a 2H:1V (Horizontal:Vertical) slope. The eastern slope is less steep, climbing at a 3H:1V to 4H:1V slope.

Surface drainage at the site is directed toward Ratcliffe Cove Branch. From the site, Ratcliffe Cove Branch flows southwestward into Racoon Creek which flows north-northwestward to its confluence with Richland Creek and ultimately Lake Junaluska.

The surface cover at the site is primarily pastureland, with some areas of brush and two 20+ year old trees on the east side of the stream. The soil test borings encountered 3 inches of topsoil at the locations tested, though thicker topsoil-laden areas could be encountered.

5.0 SUBSURFACE SOIL CONDITIONS

Soil boring B-15 encountered alluvium from just below the topsoil to a depth of approximately 2.5 feet. Only one sample was recovered from this boring before auger refusal. The sampled alluvial material consisted of dense to very dense, reddish brown and gray, silty sand with subrounded gravel that appeared to have been shaped by fluvial processes. Standard penetration resistance (blow counts, N values) were measured at 43 blows per foot (bpf).

Soil borings B-16 and B-17 encountered residuum (i.e. weathered in-place) typical of the Blue Ridge Physiographic Province at depths ranging from just below the topsoil to 11 to 12 feet. The sampled residual soil predominantly consisted of a firm to hard, reddish brown and brown, silt and sand mixture with gravel-sized rock fragments. Standard penetration resistance ranged from 10 to 42 bpf.

Partially weathered rock (PWR) is a transitional, intermediate material between the residual soil and rock, and is defined for engineering purposes as residual material having a standard penetration resistance value greater than 100 bpf. Subsurface materials with attributes resembling PWR were recorded in soil boring B-15 at a depth of 3 feet, in the sample directly below the alluvial material, but no material was recovered.

Auger refusal occurred in soil borings B-15, B-16 and B-17 at depths of 4, 11, and 12 feet below the ground surface, respectively. Auger refusal is typically interpreted as the top of bedrock, but the refusal could also be due to an isolated rock layer or boulder. The refusal in Boring B-15 (alluvial material) in interpreted as the upper surface of a boulder- or cobble-laden zone of alluvial soil and may represent an earlier meander of the branch. Rock varies erratically in this area and can vary significantly in depth and consistency over short lateral distances.

Groundwater was encountered in soil borings B-16 and B-17, measured at the time of backfilling, at a depth of 7 feet. On completion of checking for the presence of water, the boreholes were backfilled with auger cuttings. Groundwater levels may fluctuate several feet with seasonal and rainfall variations. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall. It is likely that groundwater in these borings would replicate the elevation of the water surface in the branch, given time to stabilize.

The above descriptions provide a general summary of the subsurface conditions encountered. The Boring Logs included in **Appendix B** contain detailed information recorded at each boring location. The Boring Logs represent our interpretation of the field logs based on engineering examination of the field samples. The lines designating the interfaces between various strata represent approximate boundaries and the

transition between strata may be gradational. It should be noted that the soil and rock conditions will vary between boring locations.

6.0 ANALYSIS & RECOMMENDATIONS

General Assessment

The encountered conditions at the soil boring locations on the east side of Ratcliffe Cove Branch indicate the site is suitable for the proposed construction, with minor ground modifications. Subsurface conditions on the west side of the stream have not been explored. Alluvial material was encountered in soil boring B-15 to a depth of at least 2.5 feet. Blow counts in the alluvial material indicated dense soil; however, this could be due to cobbles and not necessarily indicative of the alluvium being a sound bearing surface. Bearing the box culvert on the materials present in the stream bed is considered feasible with minor undercutting of soft fine-grained soils or organic materials. Shallow foundations also appear feasible for the arch span approach.

Foundations

Box Culvert – The bottom elevation of the culverts is planned at about 2,600.5 msl. The borings indicated either a dense gravel or cobble layer of alluvial origin or a sandy residuum at the foundation level of the box culvert. Since the culvert will mostly occupy the stream bed as opposed to the stream bank where the borings were located, BLE anticipates that the subgrade materials will be mostly alluvial. Limited undercutting to remove any soft, fine-grained soils or organic matter is anticipated. Although support of the box in not really a conventional bearing capacity issue, a bearing capacity of at least 1,500 psf is available.

Arched Span – The conceptual plan shows the arch being supported by concrete foundations in either bank of the branch. These foundations should bear below the anticipated scour line of the branch and bear in firm to dense silty sand at a depth of about elevation 2,597 msl. At this elevation a bearing capacity of 2,500 psf is available for a properly installed or cast foundation. A minimum footing width of at least 18 inches is recommended for these foundations. Many suppliers of the arch spans also provide pre-cast members for use as foundations for their product. This approach is acceptable to BLE as long as the pre-cast members meet the minimum requirements outlined herein. Also, installation of cast-in-place or pre-cast foundations are likely to encounter groundwater. A following section of this report discusses the groundwater issues.

Construction Considerations

Construction of the Box Culvert concept directly in the stream bed will obviously encounter surface water. BLE recommends that the surface water be temporarily diverted while the box(es) are placed to desired elevation in the stream bed and that the diversion channel, wherever it is located, be backfilled with compacted, preferably fine-grained soil to mitigate the risk of scour.

Construction of the Arched Span will not necessarily include work directly in the stream bed and diversion of the branch at normal flow may not be required. However, excavation to the suggested minimum elevation of 2,597 is likely to encounter saturated soils that will need to be stabilized prior to casting or installing foundations. It is also likely that groundwater will be encountered at or near the foundation subgrade level.

In either event it is probable that some form of dewatering will be required in order to stabilize the subgrade. The approach to dewatering can vary by contractor's preference and should be reviewed as part of the pre-construction process. The soils found in the borings (well-graded sands to silty sands) present some limitations to conventional (e.g. well-point) dewatering. Likewise, open excavation in the wet and placement of a gravel mat with barrel sump presents some limitations. Any approach used should emphasize the speed in which it can be employed since rapid, short-term rises in the branch are typical of mountain hydrology.

The concept for the box culvert and, perhaps, the arch span indicates a facing of modular block. The design of this facing is beyond the scope of this study; but BLE notes that this is an essential component of the crossing and should be subject to a design effort by an experienced practitioner.

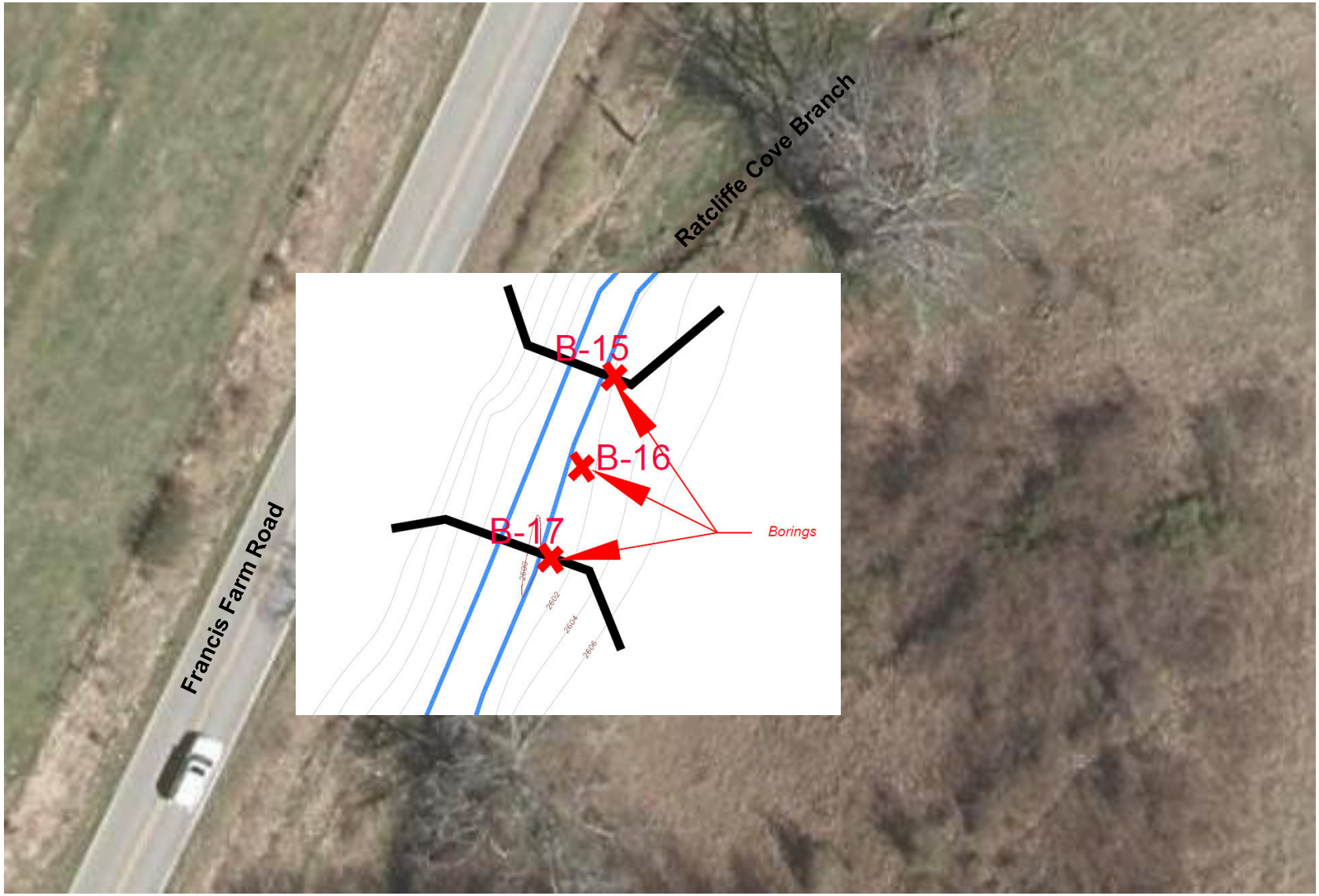
7.0 QUALIFICATION OF REPORT

The findings contained herein are based upon the data that was reviewed and documented in this report along with our experience on similar projects. It is recommended that Bunnell-Lammons Engineering be provided the opportunity to make a general review of the final, permitted plans and specifications prepared from the recommendations presented in this report. We would then suggest any modifications so that our recommendations are properly interpreted and implemented.

APPENDIX A
Figures

Figure 1 – Boring Location Plan

Not to Scale



Aerial by Haywood County GIS
Site Survey and Boring Locations by McGill Associates

BLE BUNNELL LAMMONS ENGINEERING 6004 Ponders Court I Greenville, SC 29615 864.288.1265 864.288.4330 info@blecorp.com BLECORP.COM	Drawn By: CPT Date: 7/18/19	Francis Farm Landfill Ratcliffe Cove Branch Stream Crossing BLE Project No. J19-1957-77	Boring Location Plan	Figure No. 1

APPENDIX B
Field Exploration

Field Exploration Procedures
Boring Logs
Key to Soil Symbols and Classification

Field Exploration Procedures

Soil Test Borings

The borings were made by mechanically twisting a continuous flight steel auger into the soil. Soil sampling and penetration testing were performed in general accordance with ASTM D 1586. At assigned intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final 12 inches was recorded and is designated the "standard penetration resistance." The penetration resistance, when properly evaluated, is an index to the strength of the soil and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined by a geotechnical engineer to verify the field classifications of the driller. Test Boring Records are attached, showing the soil descriptions and penetration resistance.

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL BORING NO. B-15

PROJECT: FFLF Ratcliffe Cove Branch Stream Crossing — PROJECT NO.: J19-1977-77

CLIENT: McGill Associates — START: 7/8/19 END: 7/8/19

LOCATION: Haywood County, North Carolina — ELEVATION: 2602

DRILLER: METRO DRILL, INC., T. Brown — LOGGED BY: C. Tennessen

DRILLING METHOD: CME 550, 2 1/4" Hollow Stem Auger

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

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Topsoil (3 inches)			
2600	Dense, reddish brown & gray, damp, slightly micaceous, slightly silty fine to medium SAND (SW) with subrounded gravel - (alluvium)		13 19 24	
	No recovery		50/0.5	50/0.5
5	Auger refusal at 4 feet below ground surface. Location backfilled using soil cuttings. No groundwater encountered at time of drilling.			
2595				
10				
2590				
15				
2585				
20				
2580				
25				
2575				
30				
2570				
35				
2565				

GEOT_NOWELL 1957-77.GPJ 7/18/19

BLE INC.

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL BORING NO. B-16

PROJECT: FFLF Ratcliffe Cove Branch Stream Crossing — PROJECT NO.: J19-1977-77

CLIENT: McGill Associates — START: 7/8/19 END: 7/8/19

LOCATION: Haywood County, North Carolina — ELEVATION: 2601.5

DRILLER: METRO DRILL, INC., T. Brown — LOGGED BY: C. Tennessen

DRILLING METHOD: CME 550, 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: 7 AFTER 24 HOURS: CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Topsoil (3 inches)			
2600	Firm to dense, brown & gray, damp/moist, slightly micaceous, slightly silty fine to medium SAND (SW) with gravel-sized rocks - (residuum)		6 6 7	
5			11 13 19	
2595	Hard, brown & brownish black, wet, slightly micaceous, sandy SILT (ML), occasional gravel-sized rocks - (residuum)		8 19 23	
10			13 15 19	
2590	Auger refusal at 11 feet below ground surface. Location backfilled using soil cuttings. Groundwater encountered at 7 feet below ground surface at time of drilling.			
15				
2585				
20				
2580				
25				
2575				
30				
2570				
35				
2565				

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BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL BORING NO. B-17

PROJECT: FFLF Ratcliffe Cove Branch Stream Crossing — PROJECT NO.: J19-1977-77

CLIENT: McGill Associates — START: 7/8/19 END: 7/8/19

LOCATION: Haywood County, North Carolina — ELEVATION: 2601

DRILLER: METRO DRILL, INC., T. Brown — LOGGED BY: C. Tennessen

DRILLING METHOD: CME 550, 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: 7 AFTER 24 HOURS: CAVING>

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Topsoil (3 inches)			
2600	Stiff, reddish brown, damp, slightly micaceous, sandy SILT (ML), occasional gravel-sized rocks - (residuum)		2 5 5	
5 / 2595	Firm to very firm, reddish brown, moist/wet, slightly micaceous, silty fine to medium SAND (SM) with gravel-sized rocks - (residuum)		7 11 11 / 8 8 12	
10 / 2590	Very firm, reddish brown & white, wet, slightly micaceous, slightly silty, gravelly fine to coarse SAND (SWG) - (residuum)		7 9 13	
	Auger refusal at 12 feet below ground surface. Location backfilled using soil cuttings. Groundwater encountered at 7 feet below ground surface at time of drilling.			
15 / 2585				
20 / 2580				
25 / 2575				
30 / 2570				
35 / 2565				

GEOT_NOWELL 1957-77.GPJ 7/18/19

KEY TO SOIL CLASSIFICATIONS AND CONSISTENCY DESCRIPTIONS

BUNNELL-LAMMONS ENGINEERING, INC.
GREENVILLE, SOUTH CAROLINA

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

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

*ASTM D 1586

Particle Size Identification

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

KEY TO DRILLING SYMBOLS

Grab Sample

Split Spoon Sample

Undisturbed Sample

NR = No reaction to HCL

NA = Not applicable

NS = No sample

Groundwater Table at Time of Drilling

Groundwater Table 24 Hours after Completion of Drilling

KEY TO SOIL CLASSIFICATIONS

Well-graded Gravel
GW

Low Plasticity Clay
CL

Clayey Silt
MH

Silty Sand
SM

Poorly-graded Gravel
GP

Sandy Clay
CLS

Sandy Silt
MLS

Topsoil
TOPSOIL

Partially Weathered Rock
BLDRCBBL

Silty Clay
CL-ML

Sand
SW

Liquid Sludge
SLUDGE

High Plasticity Clay
CH

Silt
ML

Clayey Sand
SC

Fill
FILL

Poorly Graded Sand
SP

Bedrock
BEDROCK

Waste
WOOD

CONSTRUCTION DRAWINGS